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THIS MONTH'S COVER

Who is more interested, the boy or the man? The eight-year old on our cover is learning that the things that he did at kindergarten have an application in real life. The picture shows Mr. George G. Greene, Lane Technical High School, Chicago, Illinois, weaving a canoe seat at a boy's camp.

IN THIS ISSUE

Industrial-arts teachers who are perturbed about the future of their work in the American school system, should not fail to read what Dr. Homer J. Smith says in his article "The Challenge of the Future" which appears in this issue. He delivered this address at one of the industrial-arts sessions at the A.V.A. convention at Kansas City.

Other interesting features are the three informal tests: One for electrical science by Axelrod; another for bench metal work by Stanaway, Race, and Williams; and a third for seventh-grade mechanical drawing by Wirth.

Mr. Waidelich's "Lesson Unit Rating Sheet" is not only interesting but should prove very helpful.

Among the interesting projects contained in this issue are a triangular end table, a paddle-wheel boat that the boy camper will rave about, an interesting way of cutting glass bottles that are to be used as lamp chimneys, some methods of storing and using scrap lumber, and a very good beginner's problem for the welding class.

Articles Indexed—The articles contained in the Magazine are regularly indexed in "The Reader's Guide to Periodical Literature," and "Education Index."
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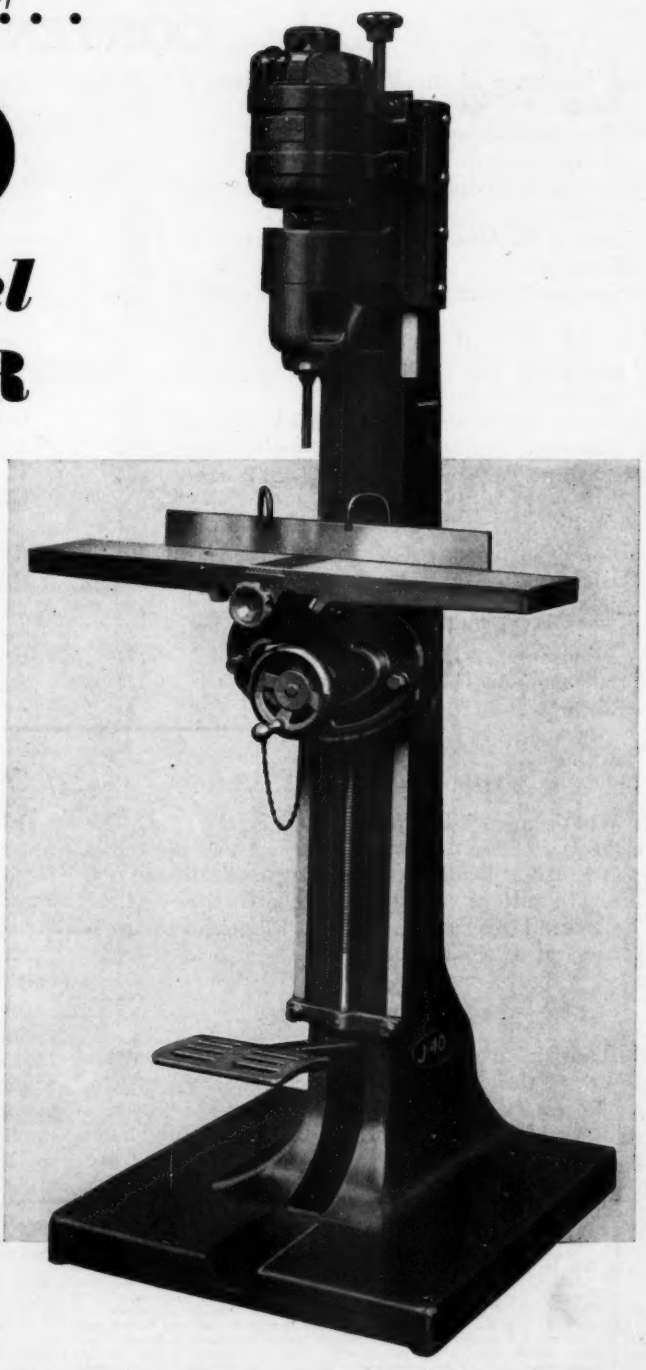
ECONOMY...

We are all interested in economy today!..

J-40

Hollow Chisel MORTISER

offers you economy in first cost and economy in operation. It does work beyond its rated capacity and it is priced surprisingly low.



Designed for mortising in hard and soft woods using chisels up to half inch square. It can be easily converted into a borer by unscrewing two bolts. Particular attention was given in its design to ease of operation and adjustment, handwheels being provided for raising, lowering and cross-adjusting the table. It is especially adapted to the requirements of manual training and vocational schools.

Illustrated circular sent upon request.

YATES-AMERICAN MACHINE COMPANY

BELOIT, WISCONSIN

Rochester, N. Y. Hamilton, Canada

INDUSTRIAL ARTS and VOCATIONAL EDUCATION
April, 1933
Vol. 22, No. 4

The Challenge of the Future

Homer J. Smith

Professor of Industrial Education,
University of Minnesota, Minneapolis, Minnesota

A scholarly presentation of what the future requires of the industrial-arts teacher in the way of preparation for his job, organization of his work, and methods of fulfilling his duties.

THERE can be no question that the future confers a challenge and that the social order of 1950 and beyond looks to the present for a blue print. Boys who now approach manhood and generations of them yet unborn look to *us* for better educational opportunities. Their daily development and their continued adjustment to a world of work are dependent upon what we provide in the realm of the "practical" subjects. Industrial-arts courses must hold their place in the schools and they must always be improved.

To ask "What next?" is not to disparage the work already done nor to fail of appreciation of our successes. We have fought our way slowly to prominence; we have gradually gained a great respect. Aims are being realized, courses are multiplying, and special officials are understood to be necessary. Our types of instruction were never accepted with less question through all the history of public education. There continues to be some adverse criticism of content, method, and costs, but we are not alone in this. The same cross-fire rakes the other special fields as well as the complete school program. Nevertheless, industrial teachers are graciously received and our leaders are looked upon as conscientious, enlightened, and courageous men who have the welfare of youth at heart and who view their work in true perspective.

Achievement of Progress

Improvement, however, must be made and therein lies the challenge. Self-satisfaction is not conducive to progress; one must be somewhat dissatisfied and unhappy to be really advancing. This desired and necessary improvement cannot be made in general. It must be made in a host of ways, by an army of workers, and through small increments of betterment. There will occasionally be long, clean strides which we can all take together, such as the project of the Committee on Standards; but, chiefly, the gains must come through the scattered yet coördinated efforts of many.

There will be teachers of more than common ingenuity; there will be supervisors who develop striking plans; there will be training institutions that devise new modes of preparation; there will be publishers and equipment firms who help us to change direction; there will be renowned general educators who see our problem and sell our stock in a better market. Progress will be of this broad-front, ever-onward, never-relenting type, fashioned after a plan known not only to some high officer and his staff, but appreciated by every worker in the ranks. Certain ideals of goodness must be agreed upon and the pattern of advance must issue frequently to the farthest camp and to the last man. It is this theory of democratic planning, with everyone voicing his views, that justifies the definite statements which follow. There is intent here to indicate briefly, for a few phases of our work, what seems worthy of our joint acceptance.

We need to announce our objectives with more brevity as well as more clarity, so that they may be easier kept in mind by all who would attain them. We need to find new ways in which to acquaint principals and superintendents with the purposes of our departments. Whatever the items in our standard lists of sins, there is one general concept which needs continual stress; namely, that industrial arts is a part of general education.

The Content of the Course

Our job as industrial-arts teachers is largely an informational one. We are not obligated to duplicate the processes of factories and other work places, but merely to sample them and to explain them. We are not attempting to produce craftsmen. We are hoping, rather, to give boys those experiences and those informations and insights that are useful in average living and in any calling. We offer instruction to boys who will become lawyers, farmers, dentists, and storekeep-

*A statement read at the Industrial Arts Luncheon, American Vocational Association, Kansas City, Mo., December 9, 1932. Luncheon theme: "What Next in Industrial Arts Education?"

ers as well as industrial workmen. If we can get universal belief of this, even among ourselves, we shall have made great advance. Then, if we can get the general schoolmen to believe it with us and to think in terms of development and readiness rather than in terms of exploration, the difficulties of respect and support and enrollment will have been largely overcome.

We need to draw a little closer together on the question of what the offering should be in schools of differing size, in communities of varying type, and at the several levels within a system. For the upper grade or the intermediate school I see no reason why we should not all employ the same few subjects. Kansas City, Gopher Prairie, or London would seem to have need in these beginning years for identically named courses, perhaps six of them, each a semester in length. These would need to be well chosen to present the geography, the transportation, the manufacture, and the ultimate uses of certain raw materials. They would need to be the best few subjects with which to picture broad classes of industrial occupations and the highly variable conditions under which industrial work must be done. Just as our departments are distinct within a school, so each of these subjects should make a special contribution. No subject deserves place unless it will do something for a boy or to a boy which none of the others will do. Beyond this junior period, I should desire that the department offer an even larger and broader set of courses than is now common and that the local conditions be then taken into account. At this higher level there should be more diversity of offering, more latitude of choice, and more intensity of treatment.

As to the numbers to be served, we must strive for a thorough cross section, or, better still, for 100 per cent of the male enrollment, each boy for at least a brief contact. We must show that our part of a true education is uniquely necessary and that it should be denied to none. And this privilege should be extended to the boys in private and parochial schools, about whose occupational preparedness we have never shown proper concern. If industrial arts is really a function of full development, and if our results are as good as we insist that they are, we stand rebuked until every American boy has these advantages, regardless of his school connections. Our slogan may well be — industrial arts for every American boy and trade training for carefully selected boys in the number that can be placed.

We may pass hurriedly over the matter of content because it is in this particular that we are making the most certain progress. *Doing* and *knowing* units are being discovered and being placed in appropriate teaching arrangements. I feel certain that we are still spending an undue portion of class time in manipulation and that, in such informational work as we attempt, we stress facts to the exclusion of enduring principles. Likewise, we are prone to neglect the histories of occupations, the qualifications of workers, and the practical conditions of employment. We are failing to realize full exploratory values because we omit or slight the knowledge elements for the sake of getting things done. We could encourage industrial studentship by teaching more during the period and by exacting more on free time. Any industrial teacher who assumes that boys can learn about industry through hand and machine work alone doesn't have full vision of his task. If, in addition, he assumes that there is nothing to be learned except in his presence or from his own meager experience, we may say that he has never learned to teach. We need more textbooks, more school-shop study periods, more home assignments, and better measurement of what has been learned.

Classroom Organization

As we are faced with larger classes, our methods and management must change and I believe that we should do more group teaching of the informational type. In manipulation, we should continue to use the individual project and job, seeking at the same time to set up more coöperative endeavors. There should be student foremanship, the coördination of courses, and correlation with the academic branches. Some way must be found to teach pride in craftsmanship, the rewards of successful competition, the monotony of routine tasks, and the economy of time as well as of supplies. Industrial credits in a boy's record must come to mean that he knows something which others have missed and that this something is important to one who must live in a practical world and who must learn in a day of increasing difficulty.

Better classroom work must come of the higher selection and the better preparation of those who would serve in the schools. A teacher must know the subject matter to be presented. He must know upon what laws of learning he can base a saving of effort. He must be master of several types of lessons, skilled in discipline, and committed to whole-school helpfulness. There must be broad, general understanding of the principles of education as a whole. There must be a margin of knowledge and skill in the industrial specialty. There is an applied psychology and pedagogy to be known as well as a special-field literature with which to be conversant. This is no meager requirement. This is no task for the dull or the indifferent. This is an assignment for only the best among us.

Even assuming better selection and better initial preparation, these teachers will need and will continue to need, day by day, help in the classroom. We must reduce the promotional, managerial, and business responsibilities of our supervisors. They cannot now make worthy use of their professional abilities. Better supervision will show us ways of handling larger numbers at the same or lowered costs. It will prove the value of our materials and procedures. It will weed out many worthless teachers. It will discover some men deserving of changed appointments, particularly from the standpoint of general or vocational aims. All teachers, teacher-trainers, principals, and supervisors must come

to believe that a given man may excel under one set of aims, but that he cannot be truly efficient under the other, even within the same occupational field.

The challenge, then, is to gradual and well-ordered improvement — in offering, content, method, and management. This will demand better teacher preparation and better supervision. These, in their turn, are conditioned by clearly stated aims upon which the great majority of us are agreed. No matter what immediate goals we may set for subjects and grades or for the department as a whole, we must keep before us the basic ideals of breadth, resourcefulness, and adaptability.

Interdependence of Industrial Arts and Vocational Education

It seems certain that, as an aim in the life and work of the ninety and nine, specialization must give way to versatility. In the early stages let us stress acquaintance and self-expression; a little later, the elementary processes and conditions of numerous employment fields; and later still, a deeper delving of a technical sort in the realm of a reasonable choice. Let us not be too much concerned about where industrial arts shall end and trade training shall begin. The day of their strict demarcation has happily passed and gone. It is all industrial education, and who shall say just what a boy or a man may need in the years ahead? The future requires improvement in both of these fields, but it makes a still stronger demand that we recognize their interdependence. It is overlapping, interweaving, dovetailing, and blend-welding that will insure success.

In the industrial life of the future, we shall need fewer workmen. With proper immigration laws and stronger compulsory education laws, the lowered birth rate has already told us that our building program may practically stop. Soon junior high schools may use some abandoned elementary building. Senior schools may overflow into present junior structures. All senior schools may then increase space and equipment for each of the "practical" subjects. The trends of compulsion and of birth rate work as hand-in-glove for our purposes.

Except to provide more industrial teachers, we need not be concerned about student numbers. But the problem of the changing work fields, the changing processes, machines, and materials will remain and will intensify. It may be that the key to this difficult situation is afforded by the industrial arts because of its guarantee of adaptability. As long as versatility helps in placement, as long as promotion means change of work, the industrial-arts courses are justified and will remain. The problem is one of improvement. The challenge is as clear as the future is certain.

A Mechanical-Drawing Course

F. J. McAuliffe

Trott Vocational School,
Niagara Falls, New York

A description of how to use a textbook in developing a usable outline of instruction adapted to the individual instruction method of teaching.

IN THE syllabus for mechanical drawing issued by the University of the State of New York, the following outline is given:

Purpose

The aims of Mechanical Drawing I may be grouped under two headings — educational and practical.

Educational

1. To develop in the pupil the power to visualize.
2. To broaden his imagination.
3. To train for accuracy of thought and expression.

Practical

1. To enable the pupil to read and make simple working drawings.
2. To develop his skill in lettering and drafting.
3. To familiarize him with correct drafting-room practice.

Scope

Mechanical Drawing I shall include:

1. Lettering and drafting conventions.
2. Free-hand working sketches.
3. Mechanical working drawings.
4. Simple projections.
5. Geometric constructions.
6. Drawing to scale.
7. Isometric projections.

Prerequisite

"Elementary drawing, as presented in the grades and especially drawing as is developed in the seventh and eighth grades of the junior high school, shall be deemed prerequisite to this course."

A two-year vocational trade drawing course, based on the foregoing, is related as much as possible to the shopwork of the student. It is divided into the following units and subdivided into jobs on an individual basis:

Unit 1. Sketching. Unit 3. Mechanical Drawing.
Unit 2. Blue-Print Reading. Unit 4. Tracing.
Unit 5. Blue-Print Making.

A minimum number of jobs under each unit is required to be completed by every student within definite time limits, careful attention being given to quality of the work rather than to quantity. The more capable student may complete as many jobs in a unit as possible, thereby stimulating his interest to a higher degree in the development of skill and technical knowledge. It may be well to combine some class instruction with the individual instruction in order to gain greater efficiency, but the clearer the jobs are laid out, the less need is there for class instruction. Difficulties in the interpretation of the printed page will arise, but practice in reading will overcome these, and develop the student's ability to follow written as well as oral directions.

It is well to adopt for class use a good textbook and build around it an outline of instruction that covers satisfactorily the work prescribed. A mimeographed copy of this outline may then be given each student so that he may know just what work is ahead of him at any time. The outline of in-

OUTLINE OF INSTRUCTION

Trade Drafting Course

Problem numbers refer to "A Primer of Blue-Print Reading" by T. A. Diamond, published by The Bruce Publishing Company, Milwaukee, Wisconsin.

Excellent 4 Good 3 Fair 2 Poor 1 Failure 0

Job No.	Problem No.	Letters = 7	Isometric Drawing	3rd Angle Sketch	Answer All Written	Answer All Oral
1	1			X 4		
2	2		X 3	X 3		
3	3		X 2	X 3		
4	4	X 3				
5	5	X 3		X 3		
6	6	X 2	X 3		X 3	X 3
7	7	X 4		X 2		
8	8	X 2				
9	9	X 4				
10	10	X 3	X	X 3		
Average		3	2.7	3	3	3
11		X	X			X
12	41-1			X		
13	12	X				
14	42-3			X		
15	13	X	X			
16	44-1			X		
17	14	X		X		
18	45-1			X		
19	15	X			X	
20	46-1			X		
Average						
21	16	X				
22	47-2			X		
23	17				X	
24	48-1			X		
25	18					X
26	49-1			X		
27	19	X			X	
28	50-3			X		
29	20	X				
30	53-4			X		
Average						
31	21	X				
32	54-4			X		
33	22	X	X			
34	55-1			X		
35	23	X				
36	58-6			X		
37	24				X	
38	59-1			X		
39	25	X				
40	60-1			X		
Average						
41	26	X				
42	27	X	X	X		
43	28	X	X			
44	29	X				
45	30	X				
46	31	X				X
47	32	X				
48	33	X				
49	34	X				
50	35	X			X	
Average						

Signature _____ **Final Average** _____

struction shown herewith is based on Diamond's *Primer of Blue-Print Reading*.[1] The jobs required of the student are indicated on the outline with an X. In some cases the job requires the completion of the whole problem as outlined in the primer, while in others the ascertaining of certain required facts is all that is necessary.

The student should make all the sketches free-hand, although it may be permissible in some cases to allow the student to use a straightedge for making straight lines. All answers should be carefully lettered, using ⅛-in. Gothic capitals, either vertical or slant. This lettering is excellent practice. Each job is to be completed on one sheet of paper, using the following as a heading:

Trott Vocational School

Unit Trade Dept. Trade Drawing
Units 1 and 2 Sketching and Blue-Print Reading Practice
Job No. ..... Rating .....

At the completion of each group of five jobs, the instructor should grade them. The student should keep his own record on the mimeograph outline sheet by transferring his ratings from the job sheet as they are given by the instructor. Some jobs may have more than one rating mark. The first group of jobs, on the outline of instruction shown, is marked to show how a student's record may look after he completes the first ten jobs. The rating scheme is very simple, but quite effective.

This method may be used during the last year of the junior-high-school drawing, or with the first-year or beginner's classes in mechanical drawing in high school, unit trade schools, or continuation schools, after the students have had sufficient instruction to use this book (*Primer of Blue-Print Reading*) for a general review or for practice work. One period a week is given to the work, with students completing jobs at their own speed. All work done should be kept in the classroom so as to prevent one student copying the work of another.

The outline covers blue-print reading and sketching in third-angle projection, with further practice in isometric projection. At any time, the instructor may give a student an individual oral quiz, although some required oral ratings are called for on the outline.

Corrections may be made on the back of the job sheet, though no job is to be continued on the back of a sheet containing some other job.

If the work is neat, allow the student to save paper by putting more than one job on the same side of a sheet. After corrections have been satisfactorily completed, the instructor O.K.'s the job, and the student may then put the O.K. on his rating sheet. It is a good plan to insist that each group of five jobs must be satisfactorily O.K.'d before the student is permitted to continue with the next group of jobs. An average rating is calculated after the completion of every ten jobs.

The instructor may transform his desk copy of the Primer into a key by filling in all answers with red ink or red pencil. Required isometric drawing may be sketched on the same page near the views drawn in orthographic projection. In Part I the instructor will not have to sketch any of the third-angle projection drawings, as he may give the Primer a 90-deg. turn in the counterclockwise or clockwise direction to get the required view — the front and top views remain unchanged. In Part 2 of the Primer the instructor will have to sketch in the required views. A key of this kind will be very effective in the rating of the jobs. No dimensions need to be placed on the projection sketches as only the relation of the views is desired; but, the instructor may require it of the students for the first few groups.

A loose-leaf notebook for 9 by 12 or 8½ by 11-in. sheets, or a bound pamphlet of some style sheets, is required for each student. A good grade of manila paper is preferred. Cross-section paper should be used for the first few groups of jobs as an aid in getting proper proportions. The student should train his eye for correct proportioning, however, by getting sufficient practice on plain paper. In the isometric-projection work both the isometric paper and plain paper is to be used. When dimensions are called for, they may be put on the same sheet with the sketches. If a loose-leaf notebook is preferred, the sheets should be punched to fit it. All notebooks should be kept in the classroom.

The jobs for Unit 3, Mechanical Drawing, also may be outlined around the Primer, thus giving the beginner practice in the use of the mechanical-drawing instruments while making mechanical drawings from his own sketches.

[1]Published by The Bruce Publishing Co., Milwaukee, Wisconsin.

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VOCATIONAL EDUCATION NECESSARY

Even today vocational education of secondary grade under public auspices is considered a waste of funds by many. Unless a pupil gains a satisfactory vocational status, we cannot expect him to become a good citizen. The finer things of life — the accessories, the superficial, the cultural — have generally come after the individual and the group have secured the necessities. — *Philips W. L. Cox.*

Informal Tests

ACHIEVEMENT TEST IN ELECTRICAL SCIENCE

A. Axelrod, Vocational School, Bayonne, New Jersey

Note: Read the instructions very carefully before starting the test.

Instructions

1. The time allotted for this test is 55 minutes at the maximum.

2. *Read* the heading at each part before starting to answer the questions of that part.

3. *Read* the examples very carefully so that you may note what is wanted.

4. Be sure to *circle* your answers in Part I; *number* your answers in Part II; *number* your answers in Part III; and *label* your answers in Part IV.

5. Part I consists of 55 true and false statements. *Do not guess* at the answers, as you will lose double credit for each incorrect answer. The score for this part is the number correct less the number wrong. It is to your advantage not to answer a question rather than to guess at it.

6. Part II consists in matching the symbols under Column II with the names under Column I. The scoring of this part is only the number correct.

7. Part III consists of 35 questions where you have to make *one* choice out of four for the correct answer. There is only one correct answer in each of these statements. The number correct is the score for this part.

8. Part IV consists of a series of drawings which have to be recognized and some of the parts labeled. The number correct is the score. Be sure that you carefully note the arrows with their numbers.

9. In Parts II and III, be sure that your numbers are very clearly written; otherwise it will be marked wrong.

10. Use a soft pencil, if possible. Ink may also be used.

Part I
True and False Statements

The statements listed below are either true or false. Place a circle about the letter T if you think the statement is true, or place a circle about the letter F if you think the statement is false.

Example: (T) F Some airplanes are made entirely of metal.
T (F) Glass is very soft.

1. T F To produce electrical energy, some other form of energy must be transformed.
2. T F A natural magnet is made by rubbing a piece of hard steel against a permanent magnet.
3. T F A dry cell is a secondary cell.
4. T F The secondary winding on a transformer receives the current from the line.
5. T F An armature is a part of a choke coil.
6. T F Nichrome wire is used in heating devices because it has a high resistance.
7. T F Storage batteries store electrical energy.
8. T F Flux is the name given to the armature wires.
9. T F There is no sharp dividing line between conductors and insulators.
10. T F All magnets must have two poles.
11. T F The liquid in the storage battery is called an electrolyte.
12. T F Generators producing alternating current are called alternators.
13. T F A mil is equal to .0001 in.
14. T F The bell transformer is used only on direct current.
15. T F An ammeter is used to measure current strength.
16. T F Most induction motors are a.c. motors.
17. T F The lamp voltage in our homes is 100 volts.
18. T F The strength of an electromagnet depends chiefly upon the number of turns of wire wrapped around the core.
19. T F A fuse inserted in a circuit will increase the voltage of that circuit.
20. T F Electricity can be controlled by conductors and insulators.
21. T F Mechanical energy can be transformed into electricity.
22. T F A wire carrying a current of electricity has a magnetic field about it.
23. T F Dilute sulphuric acid is used in dry cells.
24. T F The core of an electromagnet is made of hard steel.
25. T F The bell is the source of electricity in a circuit.
26. T F Some direct-current generators are self-excited.
27. T F The frequency of alternating current is the number of cycles per second.
28. T F There is a commutator on all generators.
29. T F Magnetism will not act through paper or glass.
30. T F Anything that will decrease the rate of cutting of the lines of force will decrease the voltage generated.
31. T F Most electrical measuring instruments depend upon magnetism for their operation.
32. T F Wires are classified according to their lengths.
33. T F Houses are wired according to the specific rules laid down by specialists and are known as the National Code.
34. T F All electrical apparatus should be properly labeled as to cycles, voltage, etc.
35. T F Potential, electromotive force, and voltage mean electrical pressure.
36. T F Transformers always change alternating current to direct current.
37. T F Primary cells can be charged by electricity.
38. T F The commutator carries the current from the armature wires to the outside circuit.
39. T F The kilowatt is equal to 1000 watts.
40. T F All generators produce alternating e.m.f. in the armature wires.
41. T F Bell wire is No. 14 wire.
42. T F All a.c. generators have slip rings instead of commutators.
43. T F A rheostat is a device used for the control of current.
44. T F Ohm was the first man to state the numerical relationship between pressure, resistance, and current of circuits.
45. T F A closed circuit is a closed path for electricity.
46. T F Edison made the first successful generator.
47. T F The induction coil has a closed solid core.
48. T F The total resistance of any number of pieces in series is equal to the sum of the separate resistances.
49. T F The magnetic flux is measured by the number of lines of force.
50. T F Heat is one of the effects of electricity.
51. T F Storage batteries depend upon chemical energy to discharge.

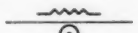
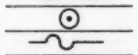
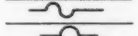
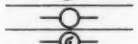
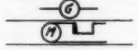
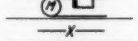
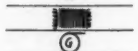
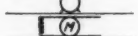
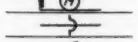
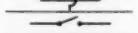
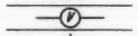
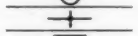
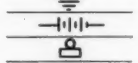
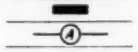
52. T F A voltmeter measures electrical power.
53. T F The moving part of an a.c. motor is called the rotor.
54. T F For commercial purposes, the dry cell is the source of electricity.
55. T F In electroplating, the chemical effect of electricity is made use of.

Score: Number right .....; Wrong.....

Part II
Recognition of Electrical Symbols

The symbols listed below are the symbols used in the electrical trade and in electrical drawing. These symbols have been adopted by the American Institute of Architects and the National Electrical Association of America.

The symbols named in column 1 are shown in column 2. *You are to find the name of every symbol and place the number of the name in the parenthesis in column 3*

	Column 1	*Column 2*	*Column 3*
Ex.:	1. Transformer		(9)
	2. Bell		( )
	3. Jumper		( )
	4. Ammeter		( )
	5. Generator		( )
	6. Single-pole switch		( )
	7. Shunt motor		( )
	8. Battery		( )
	9. Resistance		( )
	10. Galvanometer		( )
	11. Buzzer		( )
	12. Fuse link		( )
	13. Connection		( )
	14. Arc lamp		( )
	15. Incandescent lamp		( )
	16. Distributing panel		( )
	17. Push button		( )
	18. Ground		( )
	19. Voltmeter		( )
	20. Ceiling outlet		( )
	21. Series motor		( )

Score: 20 — ——— = ———

Part III
Multiple Choice

Select the proper word or words to make the statement complete and correct. *Place the number of the word or words selected in the parenthesis at the end of the statement.*

Example: All space is believed to be filled with (1) air (2) oxygen (3) ether (4) heat..... (3)

1. When current is flowing in a wet cell, first to be attacked is (1) carbon (2) zinc (3) copper (4) nickel.. ( )
2. When current is flowing in a circuit, the circuit is called (1) open (2) closed (3) broken (4) loose.... ( )
3. The law concerning the numerical relationship between the pressure, current, and resistance of a circuit was first formulated by (1) Ampere (2) Ohm (3) Volta (4) Geissler..... ( )
4. The principle of electromagnetic induction is applied to the (1) soldering iron (2) generator (3) electric battery (4) electric lamp..... ( )
5. The first man to produce an electric current by the movement of a wire across magnetic field was (1) Ohm (2) Volta (3) Edison (4) Faraday..... ( )
6. The machine that transforms electrical energy into mechanical energy is a (1) motor (2) generator (3) transformer (4) choke coil..... ( )
7. In order that magnetic flux may travel, the core of a transformer must be (1) solid (2) open (3) insulated (4) broken ..... ( )
8. Ratio of a transformer is the relationship between (1) cores (2) windings (3) insulations (4) resistances ( )
9. The device that changes alternating current to direct current is called a (1) motor (2) generator (3) commutator (4) slip rings..... ( )
10. The amperage is the same at all points in a (1) closed circuit (2) parallel circuit (3) series circuit (4) open circuit ..... ( )
11. A transformer can only be used on (1) direct current (2) induced current (3) alternating current (4) pulsating current ..... ( )
12. The core of a transformer is usually made of (1) hard steel (2) soft copper (3) soft iron (4) hard nickel.. ( )
13. A permanent magnet is used in a telephone (1) transmitter (2) fuse (3) bell (4) receiver..... ( )
14. A fuse placed in the circuit is used for (1) protection (2) increasing the voltage (3) decreasing the amperage (4) increasing the resistance..... ( )
15. A bell transformer is usually a (1) step-down transformer (2) step-up transformer (3) direct-current transformer (4) current-changing transformer..... ( )
16. The secondary leads of a transformer are the (1) short leads (2) long leads (3) input leads (4) output leads ..... ( )
17. An electromagnet is a (1) permanent magnet (2) artificial magnet (3) natural magnet (4) induced magnet ..... ( )
18. If we add to the number of turns on an electromagnet, the strength of the magnet is (1) increased (2) decreased (3) the same (4) disappears entirely.... ( )
19. A tungsten filament is more efficient than a carbon filament because (1) tungsten lamps cost more (2) the resistance of tungsten is higher than that of carbon (3) tungsten lamps are harder to make than carbon lamps (4) tungsten is harder to break..... ( )
20. The brushes on motor and generators are usually made of (1) carbon (2) copper (3) steel (4) iron... ( )
21. The unit of electrical power is the (1) watt (2) volt (3) ampere (4) ohm..... ( )
22. An ammeter is connected when measuring amperage (1) across the line (2) in series with the line (3) in parallel with the line (4) at the end of the line..... ( )
23. A motor gives (1) mechanical power (2) electrical power (3) heat (4) electricity..... ( )
24. In order that a volt be generated, a conductor must cut the lines of force at the rate of (1) 100,000 per second (2) 100,000,000 per second (3) 10,000,000 per second (4) 1,000,000 per second..... ( )
25. Nickel, iron, and cobalt are (1) nonmagnetic substances (2) magnetic substances (3) neutral substances (4) induced substances..... ( )
26. By rubbing the end of a fountain pen on the sleeve of your coat, there is produced (1) direct-current electricity (2) static electricity (3) alternating-current electricity (4) induced electricity..... ( )
27. A motor that can run on either alternating or direct current is called (1) induction motor (2) repulsion motor (3) universal motor (4) synchronous motor.. ( )
28. The heating effect of electricity is used in a (1) soldering iron (2) electric sign (3) electric motor (4) radio ..... ( )
29. If the current ratio of a transformer is 1:10, the voltage ratio is (1) 1:1 (2) 1:2 (3) 1:10 (4) 10:1.. ( )
30. The core of a transformer must be (1) laminated (2) welded (3) spliced (4) soldered..... ( )
31. Resistance wires used in electrical heating devices are made of (1) copper (2) nichrome (3) nickel (4) steel. ( )
32. The ampere is the measure of (1) air pressure (2) resistance (3) current (4) temperature..... ( )
33. Wire used for house wiring is usually (1) No. 18 (2) No. 14 (3) No. 12 (4) No. 10..... ( )

34. The storage battery stores (1) chemical energy (2) electricity (3) heat (4) mechanical energy..... ( )
35. A voltmeter is connected when measuring voltage (1) in series with the line (2) across the line (3) at the end of the line (4) in the middle of the line..... ( )

Score: 35 — ——— = ———

Part IV
Simple Recall

1. Figure 1 represents a.....
2. Part 1 is the.....
3. Part 2 is the.....
4. Part 3 is the.....

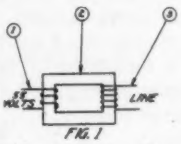


FIG. 1

Figure 2 is a two-pole, direct-current generator.

5. Part 1 is the.....
6. Part 2 is the.....
7. Part 3 is the.....
8. Part 4 is the.....
9. Part 5 is the.....
10. Part 6 is the.....
11. Part 7 is the.....

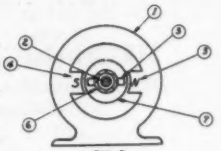


FIG. 2

12. Figure 3 represents a.....

FIG. 3

13. According to the Laws of Magnetism, Figure 4 represents.....
14. Part 1 is the.....
15. Part 2 is the.....
16. Part 3 is the.....

FIG. 4

17. These batteries are connected in .....

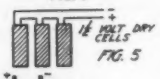


FIG. 5

18. The total voltage is.....volts
19. Figure 6 is a.....
20. Part 1 is the.....
21. Part 2 is the.....
22. Part 3 is the.....

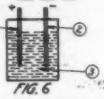


FIG. 6

23. Figure 7 represents the principle of .....
24. Part "A" is the.....
25. The parts B+ and B— are the .....

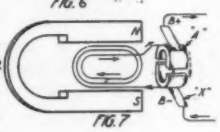


FIG. 7

26. Figure 8 is a.....
27. Part 1 is the.....
28. Part 2 is the.....
29. Part 3 is the.....
30. Part 4 is the.....
31. Part 5 is the.....
32. Part 6 is the.....
33. Part 7 is the.....
34. Part 8 is the.....
35. The reading at "A" is.....
36. The reading at "B" is.....
37. The reading at "C" is.....

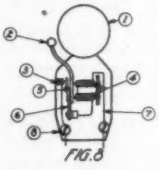


FIG. 8

Scoring Sheet

Achievement Test in Electrical Science

Part I

1. T	12. T	23. F	34. T	45. T
2. F	13. F	24. F	35. T	46. T
3. F	14. F	25. F	36. F	47. F
4. F	15. F	26. T	37. F	48. T
5. F	16. T	27. T	38. T	49. T
6. T	17. T	28. F	39. T	50. T
7. F	18. T	29. F	40. T	51. T
8. F	19. F	30. T	41. F	52. F
9. T	20. T	31. T	42. T	53. T
10. T	21. T	32. F	43. T	54. F
11. T	22. T	33. T	44. T	55. T

Part II

2. 17	6. 21	10. 22	14. 11	18. 8
3. 12	7. 14	11. 7	15. 19	19. 2
4. 15	8. 1	12. 3	16. 13	20. 16
5. 10	9. 5	13. 6	17. 18	21. 4

Part III

1. 2	8. 2	15. 1	22. 2	29. 4
2. 2	9. 3	16. 4	23. 1	30. 1
3. 2	10. 3	17. 2	24. 2	31. 2
4. 2	11. 3	18. 1	25. 2	32. 3
5. 4	12. 3	19. 2	26. 2	33. 2
6. 1	13. 4	20. 1	27. 3	34. 1
7. 1	14. 1	21. 1	28. 1	35. 2

Part IV

1. Transformer or step-down transformer. 2. Secondary winding. 3. Core or iron core. 4. Primary winding. 5. Housing or frame. 6. Shaft. 7. Brush. 8. South pole piece or south pole. 9. North pole piece or north pole. 10. Commutator. 11. Armature. 12. Magnetized bar. 13. Attraction. 14. North pole of magnet or north pole. 15. Lines of force. 16. South pole of magnet or south pole. 17. Series. 18. 4½ volts. 19. Simple wet cell. 20. Copper pole or positive pole or terminal. 21. Zinc pole or negative pole or terminal. 22. Dilute sulphuric acid or electrolyte. 23. Electromagnetic induction. 24. Commutator. 25. Brush. 26. Bell. 27. Gong. 28. Hammer. 29. Contact screw. 30. Coils. 31. Armature. 32. Spring. 33. Wire. 34. Binding post. 35. 1,365 kilowatt hours. 36. 11,095 kilowatt hours. 37. 25,975 kilowatt hours.

INFORMAL TEST IN BENCH METAL WORK

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The tests submitted herewith are a few taken from a series of 32 worked out for the household-mechanics classes in the junior-high-school system of Lansing, Michigan.

The following is a group of incomplete sentences. Read each sentence carefully, then fill in the word, or words, which will make it complete.

1. Three tools having wedge edges are....., ... and .....
2. The butcher uses a steel to put a ..... edge on a knife, and the barber uses a strop to put a..... edge on his razor.
3. Oil is used on an oilstone to prevent .....
4. Two tools having bevel edges are ..... and .....
5. A substance that wears away by friction is called an .....
6. Water is used on a hand grinder to prevent .....
7. If a tool is overheated on the grinder the .... will be removed.
8. A fine saw-tooth edge on a butcher's knife is called a ..... edge.
9. Manufactured gas is measured by the .....
10. The dials of a gas meter are as follows:

.....

(Draw circles to represent dials.)

11. Hack-saw blades are made of.....steel.
12. The hardness of a metal is called .....
13. Temper can be removed from metal by .....
14. When steel turns ..... on the grinder the ..... is removed.
15. A tool used to make indentations on metal is called a .....
16. Rivets are made of ....., ... or .....
17. A piece of metal around the end of a handle is called a ..... and is put on the handle to ..... it.
18. Some metals that can be filed are ....., ..., ... and .....
19. Some metals that can be cut with a cold chisel are ....., ... and .....
20. When tracing a project on a piece of metal we use a ..... or ..... as a guide.
21. The edges of sheet metal may be strengthened by ..... or .....

22. The two kinds of tin we have in the shop are ..... tin, and ..... tin.
23. Galvanized iron is thin sheet iron covered with a coating of ..... to prevent it from .....
24. The term "1-lb. rivets" means there are ..... rivets to ..... pounds.
25. Two sizes of rivets are ..... and .....
26. By "reversing" a mortise lock we mean to turn the ..... over in the lock so that the ..... side will hit the latch plate.
27. The plates on the sides of the door are called the .... plates.
28. The door knobs are held on the spindle by ..... screws.

Number attempted .....
Number wrong .....
Score .....

The following is a group of statements, some of which are true, and some of which are false. Read carefully each sentence, and if you think it is true, draw a circle around the capital T. If you think it is false, draw a circle around the capital F.

1. Oily rags and waste should be placed in wooden containers ..... T F
2. The rule should be set on edge when it is used for measuring ..... T F
3. A lock which is set in the door is called "mortise" lock ..... T F
4. Butt hinges are usually used for hanging doors..... T F
5. Nails often make good rivets..... T F
6. A good knife may be made of soft steel..... T F
7. It is not necessary to draw the temper in a knife before drilling the holes for the handle..... T F
8. A cold chisel has a bevel edge..... T F
9. All kinds of metals may be filed..... T F
10. It is not necessary to remove the escutcheon plates when removing a lock from the mortise..... T F
11. Tin or galvanized iron may sometimes be used for knife handles instead of wood..... T F
12. The temper in a knife will not be affected by hard grinding ..... T F
13. Hack-saw blades can be used in making knives.... T F
14. When tools are being whetted it is important to use heavy oil on the stone..... T F
15. A wire edge on a knife is put on by use of an oil-stone ..... T F
16. A cold chisel can be used in cutting all metals..... T F
17. A piece containing too much solder can be ground down on the grinder..... T F
18. A ferrule can be used in place of rivets on a knife.. T F
19. All hands on a gas meter run clockwise..... T F
20. One hundred cubic feet is the smallest amount a gas meter will register..... T F

Number attempted .....
Number wrong .....
Score .....

The following is a group of incomplete statements. After each statement are three phrases, each preceded by a number. Place a circle around the number at the end of the statement which corresponds to the right answer.

1. Oily rags are to be put in a 1. wooden container, 2. metal container, 3. pasteboard container.... 1 2 3
2. The lock that is set in a door is called a 1. padlock, 2. mortise lock, 3. rim lock..... 1 2 3
3. In hanging an ordinary door we use 1. strap hinges, 2. butt hinges, 3. T hinges..... 1 2 3
4. Rivets are sold by the 1. hundred, 2. pound, 3. yard 1 2 3
5. A cold chisel has a 1. wedge edge, 2. wire edge, 3. bevel edge 1 2 3
6. In making a knife, we use 1. iron, 2. steel, 3. brass 1 2 3
7. For riveting, we use 1. soft iron, 2. nails, 3. steel 1 2 3
8. In sharpening a cold chisel we use a 1. file, 2. grinder, 3. whet stone..... 1 2 3
9. For riveting we use a 1. setting down hammer, 2. raising hammer, 3. ball-peen hammer..... 1 2 3
10. Manufactured gas is measured and sold by the 1. cubic inch, 2. kilowatt hour, 3. cubic foot.. 1 2 3

Number attempted .....
Number wrong .....
Score .....

MECHANICAL-DRAWING TESTS

M. B. Wirth, Hampstead Hill Junior High School, Baltimore, Maryland

Test for Grade 7B

Directions to Pupil

This is a multiple-choice test. There are five statements to each problem. Read each statement thoughtfully, then draw a circle around the letter which appears before the answer that you think is the correct one.

Sample: The draftsman's triangle is used to draw
- a. arrowheads
- b. circles
- (c.) vertical lines
- d. arcs
- e. irregular curves

1. A working drawing
   - a. is a picture drawing
   - b. shows one view without dimensions
   - c. shows the necessary views and dimensions
   - d. is always a sketch
   - e. is drawn for the draftsman
2. A T square is used to
   - a. draw circles
   - b. sketch with
   - c. draw vertical lines
   - d. draw horizontal lines
   - e. test wood when planing
3. One of the angles in the 30—60° triangle is equal to
   - a. 42°
   - b. 45°
   - c. 50°
   - d. 90°
   - e. 180°
4. Both of the draftsman's triangles have an angle of
   - a. 30°
   - b. 60°
   - c. 45°
   - d. 360°
   - e. 90°
5. The draftsman's triangle is used to draw:
   - a. arrowheads
   - b. circles
   - c. vertical lines
   - d. arcs
   - e. horizontal lines
6. An over-all dimension gives the
   - a. radius of an arc
   - b. diameter of a hole
   - c. distance between extreme points
   - d. dimension of a part of the object
   - e. length of the drawing
7. The top view of an object is placed
   - a. below the front view
   - b. above the front view
   - c. to the left of the front view
   - d. to the right of the front view
   - e. in the center of the paper
8. The compasses are used to draw
   - a. horizontal lines
   - b. vertical lines
   - c. arcs
   - d. inclined lines
   - e. straight lines
9. The needle point on the compasses should project beyond the lead point about
   - a. 1/2 in.
   - b. 1/32 in.
   - c. 1/64 in.
   - d. 1/4 in.
   - e. 1/8 in.

10. Most objects have
    a. three over-all dimensions
    b. five over-all dimensions
    c. two over-all dimensions
    d. one over-all dimension
    e. four over-all dimensions

11. An invisible object line is
    a. darkest of all the lines
    b. light
    c. medium
    d. very dark
    e. very light

12. Border lines should be darker than
    a. center lines
    b. object lines
    c. extension lines
    d. dimension lines
    e. fraction lines

13. Horizontal dimensions are always placed
    a. above the top view
    b. below the views
    c. to the right of the front view
    d. to the left of the side view
    e. anywhere

14. The height of dimension numbers should be
    a. 1/16 in.
    b. 1/4 in.
    c. 1/32 in.
    d. 1/8 in.
    e. 1/64 in.

15. A triangle has
    a. five
    b. three
    c. two
    d. six
    e. four
    sides and angles.

16. The tips of the arrowheads must touch the
    a. fraction lines
    b. border lines
    c. extension lines
    d. object lines
    e. guide lines

17. The drawing board is made of
    a. oak wood
    b. mahogany wood
    c. hard wood
    d. soft wood
    e. any kind of wood

18. The end view of a circular hole looks like
    a. a straight line
    b. an arc
    c. a circle
    d. a slanting line
    e. a horizontal line

19. A scale is used to
    a. draw horizontal lines
    b. draw vertical lines
    c. measure lines
    d. draw slanting lines
    e. make arrowheads

20. The side view of an object is usually placed
    a. beside the front view
    b. over the top view
    c. under the top view
    d. under the front view
    e. in the center of the paper

21. The space between the object and dimension lines should be
    a. 1/8 in.
    b. 1/16 in.
    c. 1/5 in.
    d. 3/4 in.
    e. 1/4 in.

22. The pencil point used for drawing lines should be
    a. round
    b. very short
    c. blunt
    d. flat
    e. thick

23. The degree of pencil lead commonly used for sketching is
    a. 6H
    b. 3H
    c. 2H
    d. 5H
    e. 4H

24. The degree of pencil lead used for drawing mechanical drawings is
    a. 5H
    b. 3H
    c. 2H
    d. 4H
    e. 9H

25. When using the triangle on the T square for drawing vertical lines the pencil stroke is made from
    a. top to bottom
    b. right to left
    c. left to right
    d. bottom to top
    e. side to side

Test for Grade 7A

Directions to Pupil

This is a multiple-choice test. There are five statements to each problem. Read each statement thoughtfully, then draw a circle around the letter which appears before the answer that you think is the correct one.

Sample: The draftsman's triangle is used to draw
    a. arrowheads
    b. circles
    (c.) vertical lines
    d. arcs
    e. irregular curves

1. One thirty-second of an inch is
    a. equal to 2/64 in.
    b. equal to 1/8 in.
    c. more than 1/16 in.
    d. less than 1/64 in.
    e. the same as 1/4 in.

2. An arc is
    a. a straight line
    b. a part of a circle
    c. a vertical line
    d. a slanting line
    e. a parallel line

3. When dimensioning an arc the draftsman gives its
    a. length
    b. width
    c. diameter
    d. radius
    e. thickness

4. A straight line tangent to an arc touches the arc at
    a. two points
    b. four points
    c. no points
    d. one point
    e. all points

5. Parallel lines are lines that are
    a. cross each other
    b. crooked at a point
    c. meeting at a point
    d. always vertical
    e. an equal distance apart

6. A fillet is
    a. an arc
    b. a straight line
    c. a vertical line
    d. an over-all dimension
    e. a circle

7. When dimensioning a circle the draftsman gives
    a. the radius
    b. the length
    c. the diameter
    d. the circumference
    e. the thickness

8. Always draw the object
    a. upside down
    b. in its natural position
    c. with top in front
    d. with top on side
    e. in any position

9. A detail dimension gives
    a. The measurement of the drawing paper
    b. the measurement of a part of the object
    c. the extreme distance on an object
    d. the height of an object
    e. the length of an object

10. When objects are drawn half size the dimension numbers give
    a. full-size measurements
    b. half-size measurements
    c. quarter-size measurements
    d. eighth-size measurements
    e. three-quarter-size measurements

11. A semicircle looks
    a. like the full moon
    b. like a sphere
    c. like a triangle
    d. like a half circle
    e. like a rectangle

12. Invisible object lines are used to show
    a. measurements of circle
    b. hidden parts of an object
    c. dimensions
    d. where to letter
    e. where to saw

13. Each angle in a square is equal to
    a. 60°
    b. 45°
    c. 90°
    d. 50°
    e. 180°

14. A rectangle looks exactly like
    a. a square
    b. a triangle
    c. a circle
    d. an oblong
    e. a semicircle

15. A "boss" on an object is
    a. a circle
    b. a part that projects above the surface
    c. an arc
    d. a hole
    e. a fillet
16. Extension lines should extend beyond the tips of the arrowheads
    a. 1/16 in.
    b. 1/4 in.
    c. 3/8 in.
    d. 1/2 in.
    e. 1/8 in.
17. Center lines extend beyond views only about
    a. 1/4 in.
    b. 3/4 in.
    c. 1 in.
    d. 5/8 in.
    e. 1/2 in.
18. The circumference is the distance around
    a. a square
    b. a rectangle
    c. a triangle
    d. a circle
    e. a hole
19. The height of dimension numbers is
    a. 1/4 in.
    b. 1/16 in.
    c. 1/32 in.
    d. 1/2 in.
    e. 1/8 in.
20. Fraction lines must be drawn in the same direction as the
    a. extension lines
    b. dimension lines
    c. border lines
    d. guide lines
    e. center lines
21. The type of lettering we use is
    a. Slanting Gothic
    b. Old English
    c. Script
    d. Vertical Gothic
    e. Block
22. The space between words is usually
    a. the same as the space between letters
    b. any space
    c. equal to the height of the majority of the letters
    d. one-half inch
    e. equal to the height of the capitals
23. An arc is part of a
    a. triangle
    b. rectangle
    c. square
    d. hexagon
    e. circle
24. Working drawings are used by
    a. draftsmen
    b. laborers
    c. shop men
    d. blue printers
    e. errand boys
25. The number of over-all dimensions shown on two views of a brick is
    a. four
    b. six
    c. two
    d. three
    e. one

Model Yacht Building and Racing

Robert J. Benson

Jefferson Intermediate School,
Detroit, Michigan

An article on a very popular club activity fostered in Detroit's intermediate schools. The climax of the year's activity is a regatta sponsored by the schools and by the Detroit Yacht Club.

Model yacht building and racing have become successful extracurricular activities in the Detroit public schools. This is natural, for practically all boys are interested in boats. If a student is permitted to select his own shop project, a boat will usually be one of his first three choices.

In Detroit, model boat building is taught as a club activity, and all club members are privileged to work in the school shop several extra hours each week. The climax of the year's clubwork is the city model yacht regatta which takes place in June.

Membership in the boat club is open only to those who can demonstrate their fitness for it, and only those can retain the membership who make satisfactory progress. The club is usually sponsored by one of the shop instructors who interviews each applicant for membership. The prospective member must (1) have the consent of his parents to remain after school at least one night each week, (2) possess a satisfactory school record, and (3) be able to guarantee payment for all materials used in carrying on the building of his boat.

After being admitted, the student must decide what type of boat he wishes to build. The 24-in. sailboat has proved to be an excellent model for the beginner because even when fully rigged it can be readily carried on the street car or in an automobile. During the last three years this size has furnished some of the keenest competition in the races.

Drawings for models can be obtained from books and magazines.[1]

Building the models furnishes great sport for the boys, but the real fun starts when the sailing and racing begins. In Detroit each sponsor tries to take his club to some park lagoon as soon as a few boats are finished. There he gives instruction in the fundamentals of sailing, and helps the young sailors get their crafts tuned up. Members are encouraged to spend as much time as possible in practicing. Some of the boys bring their fathers along, and both father and son find great sport in adjusting the sails and rigging, and in racing the boats.

Mr. L. K. Wood, member of the Detroit Yacht Club and veteran catboat sailor and racer, is always willing to be present at any of the club meetings to give the youngsters the benefit of his long experience. The boys thoroughly appreciate his tips and get a great thrill out of putting his suggestions into execution.

The all-city regatta is annually sponsored jointly by the Detroit Yacht Club and the Detroit public schools. Individual prizes are awarded to the winners in the various classes by the Yacht Club, while the school presents a pennant emblematic of the city championship to the school making the most points. This municipal contest originated in 1930 and the number of entries has grown steadily. Last year more than 100 boys representing 13 of the city's 21 intermediate schools, entered the races. The entries are divided into two classes:

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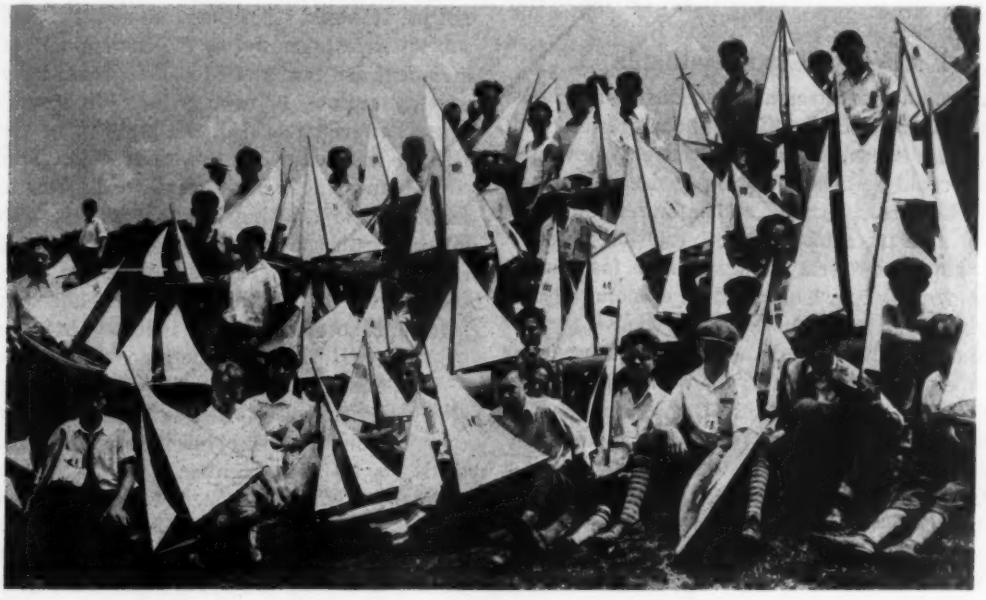
[1]The following articles on sailing models have appeared in INDUSTRIAL ARTS AND VOCATIONAL EDUCATION:
"Miniature Racing Yachts Built at Toledo," by A. M. Youngquist, August, 1926, p. 279.
"Model Yacht Building," by E. S. Tuttle, June, 1927, p. 212.
"Boats" (A Yacht), by A. F. Bick, April, 1928, p. 137.
"The Sea Scout" (Model Yacht), by A. M. Youngquist, February, 1929, p. 69.
"Sheet-Metal Sailboat," by Arthur F. Ryan, May, 1929, p. 200.
"A Model Catboat," by H. G. Stintsman, May, 1929, p. 203.
"A 44-in. Sailing Sloop," by Claude Wm. Horst, June, 1931, p. 219.
"A Twenty-Five-Inch Sailing Sloop," by Claude Wm. Horst, December, 1932, p. 353.
Model Boat Building (book), by John W. Cavileer. The Bruce Publishing Company, Milwaukee, Wis.
Model Sail and Power Boats (book), by Claude Wm. Horst (In preparation). The Bruce Publishing Company, Milwaukee, Wis.

Class A includes all boats up to 24 in. in length and Class B, all boats over 24 in. up to and including 36 in.

The following eight officials are necessary at one of these regattas: Two registration clerks, two starters, and four judges. The clerks record the names of the entrees on triplicate heat sheets. One copy of this list is sent to the starters, one to the judges, and one is kept by the clerks. Each entry receives a set of printed directions and three large numbers which he pins to his main sail for identification. The starters call the heats, line them up and give the starting signal. The judges, on the opposite side of the lagoon, pick the three leading boats as they cross an imaginary line drawn parallel to the starting line. Place ribbons are awarded to the heat winners who may then register for the semifinal heats. The victors of the semifinals then register for the finals.

After the winners in the two classes have been selected, a consolation free-for-all from which all previous winners are barred, is run. Places are awarded and prizes given as in the other classes. Points toward winning the pennant are also allowed for placing in this event.

The point system used is as follows: The first-place winners earn 5 points; second-place winners, 3; and third-place, 2. At first, points were awarded to final winners only, but hereafter they also will be allowed for preliminaries and semifinals.



The contenders eager to begin the race

Plans are under way to add a motor-boat division next year, and already much interest is being shown.[2]

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[2]The following articles on power models have appeared in INDUSTRIAL ARTS AND VOCATIONAL EDUCATION:

"Toy Motor Boat," by C. Anthony Van Kammen, March, 1930, p. 117.

"A Thirty-Inch Model Cruiser," by Claude Wm. Horst, March, 1931, p. 92.

"A Fifteen-Inch V-Bottom Speed Boat," by Claude Wm. Horst, December, 1931, p. 446.

"Model Power-Boat Racing," by J. S. Turnbull, April, 1932, p. 124.

Model Boat Building (book), by John W. Cavileer. The Bruce Publishing Company, Milwaukee, Wis.

Model Sail and Power Boats, by Claude Wm. Horst (in preparation), The Bruce Publishing Company, Milwaukee, Wis.

WHAT'S IT ALL ABOUT?

Allen D. Backus, Director of Manual Training, Newark, New Jersey

The kindergarten class visited the manual-training shop in an elementary school not long ago. These bright-eyed, wide-awake tots, lined up against the wall, watched the boys of an upper grade industriously at work at the benches. The visit was an event of great importance in the lives of these youngsters; they even took some of the most common shop tools back to the kindergarten and reproduced them in clay.

After it was all over they talked about the visit, and their teacher questioned them as to what they had seen. The question "What kind of shop did you visit?" brought forth many answers. One lad said it was a workshop, another the school shop, while a third said it was Mr. F.'s shop. Jimmy apparently disagreed with all of these designations, for his arm continued to wave frantically. When finally asked to contribute his idea he triumphantly asserted, "I know what kind of shop it is. It's a *learning* shop."

We sometimes wonder as we go about and watch various teachers of shopwork conduct their classes just what they would call their shop. We wonder if they would hit the nail as squarely on the head as Jimmy did.

It is very important that you know just what kind of shop you teach in. If you know this, it follows that you will have well-defined objectives, that when you plan a project you will have these objectives in mind, that you will study the rest of the school curriculum so that you are sure what you teach isn't over the heads of the boys you are teaching, that you will have deep, well-founded convictions as to why manual training should be a part of the elementary-school curriculum, and that you will be able to justify the teaching you do and the projects you use from an educational point of view.

If you are a teacher of manual training, take the job seriously, talk about it, read about it, and think a whale of a lot about it; not as an isolated proposition but as something which is necessary to the whole educational scheme.

Let us repeat: If you are a teacher of manual training make it your business to know what it's all about.

INDUSTRIAL ARTS *and* VOCATIONAL EDUCATION

J. J. Metz, Editor

Economy that is Valuable

At one of the industrial-arts sessions of the American Vocational Association Convention at Kansas City, Ross C. Cramlet mentioned a plan whereby quite a bit of saving could be achieved. He urged shop teachers to try to impress upon their students to save a screw or a nail or a piece of sandpaper each class period. He also showed how great savings could be inaugurated by choosing projects which could be economically cut out of standard sizes of lumber.

Economies of this kind do not cost anything except the labor expended in planning the work and in selling the idea to the students. There is, however, another phase to this idea of economy, and that is the thrift idea which is instilled in the student so taught. The screws and nails that are lost because they are carelessly thrown on the floor and then swept up with the shavings have cost money, but they have achieved no useful end. The student who has been trained to fully realize that, will have received a valuable lesson to carry along through life.

Teachers themselves can do much in setting a good example in the thrifty use of everything that goes with the conduct of a shop. The lumber that is carelessly wasted, the glue that is allowed to spoil, the light that is allowed to burn when it is not needed, the water faucet that is not turned off or that is allowed week after week to function with a leaky valve are all shining examples of thriftlessness, and each of them represents a wasted opportunity to instill a valuable thrift habit into students who ought to grow up imbued with the idea of conducting their own affairs, the affairs of their families, of their communities — yes, of their nation with economical forethought and efficiency.

Selling the Industrial Arts

From all over the country come tales of the suspension of the so-called special subjects. As the pinch of the depression becomes more and more felt, taxpayers in desperation seek to reduce the cost of city, county, state, and federal expenditures to a minimum. That not all cuts in the budgets are wisely made under such conditions is self-evident, and it is not surprising to learn that necessary educational functions are suspended simply because those whose duty it is to defend them are powerless in the face of political groups who insist that drastic cuts be made even if these reductions make certain necessary work practically impossible.

The question frequently asked is "Why is it possible that industrial arts can be so readily removed from the curriculum? Whose fault is it that this can be done?

It goes without saying that industrial arts could not have been included in the curriculum were it not for the fact that the superintendent was able to convince his board of education that this subject should be taught. It would seem therefore also that before that subject were taken out of the curriculum both superintendent and board of education would have to have weighty reasons to reverse their decision. In many cases, however, this does not seem to be the case at all. The removal of the subject is simply looked upon as an expediency. Shop costs are higher than those found in the teaching of other subjects. Hence the greatest gain can be made by abolishing the one in favor of the others. Then too, industrial arts is one of the subjects that has been but lately added and therefore, as is so often done in industry, it is the first to be considered when reductions are to be made.

Then too, it is comparatively easy to decide that almost any subject is of little value in schoolwork and therefore might just as well be abolished. Take arithmetic, for instance. So little use have most people for this subject which is thought to be quite important in school, that as far as their life's needs are concerned, the schools could well afford to stop arithmetic in the sixth grade. Yet, would any sane man, interested in the future of our country, think for one moment that that should be done in the preparation of our future citizens? In the subject of English, the common observance is that students from the eighth grade in many instances know neither how to read nor to write properly. Again, would anyone dare to suggest that the teaching of reading and writing be abolished until times get better and money more easily obtainable?

The results of industrial-arts teaching are as far-reaching and frequently farther reaching in the lives of the pupils of the public schools than are some of the other subjects. It is therefore difficult to understand why that subject can be abolished with such seeming equanimity. Probably the only reason is that because of its newness in the curriculum, neither the superintendent, the board of education, nor the principals have a well-founded comprehension of the phillosophy of industrial-arts work. The future existence of the subject then necessarily depends upon the shop teacher. Logically speaking, it ought not to be his duty to sell the subject because he had nothing to do with its inclusion in the curriculum, but necessity nevertheless places that job on his shoulders. Besides being called upon in most instances to develop his own outline of course, he must also be the publicity agent for his own work. Many of the shop teachers feel that this selling of their subject really amounts to advertising themselves. Many of them in their modesty, shrink from doing this, but it is not the individual, but the subject that must be placed before the public. That credit for good industrial-arts work should heap honors

on the teacher is but natural, but that is merely a by-product of the right kind of publicity to get the desired recognition for the subject.

The teacher, in the selling of his subject, must make use of the same tactics that the merchant employs in the sale of his wares. There are some shop teachers who get desired publicity by placing a news item into their local paper at least once a week. This is advantageous and worth while. Most city editors will be glad to give space for such materials, if they are sure to get a good story at a definite time.

Exhibits are not new, but they are by far not held frequently enough to keep the subject before the public. As a matter of fact, a program could be worked out in which a live exhibit, to be shown in prominent local stores could be started soon after the school year opens and continued until the very end of school. Very few retail and even wholesale merchants would attempt to do business without the aid of show-window displays of their wares. If it works well in the selling of manufactured goods, it will have equally good results in the selling of an idea. The merchants, especially the department stores, are usually glad to provide window space for such a display.

Then there are annually many entertainments held by churches, and by fraternal, civic, and social organizations. The officers of many of these groups, no doubt, would gladly assign sufficient space so that a small exhibit of the work done in the school shops could be given on the evening of their entertainment. This would materially assist to keep before the public mind just what is being done in the school shop, how it is done, and why it is done.

Such propaganda cannot help but be beneficial and if persisted in will help industrial arts assume the position it deserves among the other subjects in the curriulum. Furthermore, it is propaganda that the teacher can spread and control. While it presents an added burden, it is something that the shop teacher who believes in the value of industrial arts, will be glad to assume knowing as he does, that without his active assistance this valuable type of general education will otherwise be doomed in many places.

The Economy of Practicing Safety

How much good could be accomplished during the present period if the American people would turn over two billions of dollars to the relief-giving agencies of this country? How gladly would such a contribution be welcomed! How impossible it seems that such a large sum could be levied on a people already hard hit by many forms of taxation. Yet, approximately two billion dollars were contributed by the people of this country in payment for their own carelessness during 1932.

It is encouraging to learn that the accidental death rate for last year is lower than it has been since 1924. Nevertheless, 70.5 accidental deaths per 100,000 population is still too high. Statistics taken from the report made by the National Safety Council show that out of a total of 88,000 fatalities which occurred in 1932, 29,500 are attributable to motor vehicles, 18,000 to other deaths occurring outside of the home or place of business, 28,000 in the home, and 15,000 in industry. This shows that there is still much to do in the promulgation of the idea of safety, and the school, especially the school shop, can make a real contribution in this field.

As shown by the statistics just quoted, the home claims almost as many lives as do motor vehicles. Industry, with its safety literature, safety drives, and safety teaching, has accomplished quite a bit in reducing the yearly death toll which was so appallingly great in years past. The home and the highway ought, however, to be made much safer.

Probably the school can so mold popular opinion that the reckless, unsafe driver becomes as unpopular as was the slacker during the World War. Probably also the school shop could make the boy and girl much more safety conscious for his home life and for the time which he spends outside of school or home.

It is true, the schools have already done much in this safety movement, but they can do still more in the conscious preparation of the future citizen as one who considers not only his own safety, but the safety of others as well.

The fire loss in this country annually runs up to many millions of dollars. It is true, we have a Fire Prevention Week, and the schools already help to call America's attention to the dreadfully high tribute which this country annually pays to the demon fire. But again the school can do still more to impress young America with the dreadful economic loss brought about by this form of carelessness. In this way unnecessary waste could be avoided and the amounts thus saved put on the proper side of our economic ledger. To accomplish these savings, means that the school would have to work still harder in habituating its students in the practice of care and foresight.

The losses produced by fire and through accidents, just like the losses produced by war, may add to the total sum of labor required of the human family, but it is unproductive labor at best. Rebuilding a house destroyed by fire, repairing or replacing a wrecked automobile, mending broken bones and nursing back health and nerves shattered in a traffic accident, burying the victim of a fatal accident, all of this means extra labor, but it is labor that adds nothing to the wealth of the nation.

Increasing the amount of safety instruction which is already given in the school, undoubtedly means much work, but the reduction of suffering, of unhappiness, of misery which will be the resultant thereof, is worth every effort. Then too, the economic gain acquired as a by-product would do much to either decrease the number of the needy, or permit better care being taken of them in times such as those through which we are passing at present.

LESSON UNIT RATING SHEET

Teaching Unit Topic _____

Objective: _____

_____

		0 1 2	3 4 5 6 7	8 9 10
Step One	IDEAS	Poorly selected; of little or no value in stimulating attention, curiosity, interest, or desire; wasteful of time and effort.	Of doubtful value; ineffective in arousing sufficient attention, curiosity, interest, or desire; more time and effort than necessary.	Well-selected; stimulating attention, curiosity, interest, or desire; conserving time and effort.
	Rate here			
	METHODS	Insufficient or unsuited or excessive; wasteful of time and effort.	Partially effective; not too well chosen or used; better methods would improve lesson.	Just right; well suited to the lesson; economical of time and effort.
	Rate here			
	QUESTIONS AND ANSWERS	Vague, lengthy, general, or unstimulating questions encouraging evasive yes or no answers; including new learning content.	Not the best nor yet wholly ineffective; arousing some interest and curiosity and vaguely suggesting the new content to come.	Brief, direct, stimulating, well-distributed questions suggesting clear, concise, reasoned answers, leading to new learning content.
	Rate here			
Step Two	TEACHING POINTS	Confusing and disconcerting to learners; too much or too little; very little or no learning values; unsuited to place or conditions; learners uninterested or demoralized; wasteful of time and effort.	Not the best in teaching value; too many or too few; some very pertinent to objective and some unnecessary to objective; only fairly well suited to the learners.	Objectively clear and wholly suited to the learners; progressively presented; about the right number and all suited to the teaching conditions; attention and interest fully sustained.
	Rate here			
	METHODS	Insufficient or unsuited or excessive; wasteful of time and effort; provoking no thinking.	Partially effective; not too well chosen or used; better methods would improve lesson.	Just right; well suited to the lesson; economical of time and effort.
	Rate here			
	QUESTIONS AND ANSWERS	Vague, lengthy, general or unstimulating questions encouraging evasive yes and no answers.	Both good and poor questions, many of a doubtful value; encouraging some thinking and response but possible of improvement.	Brief, direct thought-provoking well-distributed questions suggesting clear, concise, reasoned answers.
	Rate here			
Step Three	APPLICATION	Learners lost, unable to go ahead understandingly, needing much help; very little confidence and much confusion.	Learners participating without enthusiasm; making too many mistakes, needing a little too much help; learners somewhat confused.	Learners active, participating, and successfully carrying through all new learning content in the most approved manner with a minimum of assistance.
	Rate here			
	CHECK-UP	Instructor involved in reteaching or having to go into excessive explanations or other devices; much loss of time and effort; instructor at loss how to proceed.	Instructor doubtful of learner's ability and giving only questionable assistance.	Instructor helping in just the right amount, properly evaluating learners' efforts; encouraging and fixing the lesson content.
	Rate here			
Step Four	TESTING	Learner can not do, or does not know how to apply or to explain what was taught, when conditions are altered.	Learner shows the gain of some new abilities and (or) knowledge; indicates considerable uncertainty when conditions are slightly altered.	Learner does and knows what instructor taught; can apply ability and knowledge unaided and under altered conditions.
	Rate here			
	INSPECTION	Instructor gave up or guessed learners could do or knew how.	Instructor got most of it over to most of class; guessed at extent of some of learner's abilities and knowledge.	Instructor definitely determined extent of learner's ability and knowledge; left no part of the learning unfinished or to chance and did not have to back-track on lesson.
	Rate here			
	CHARACTERISTICS AND POLICY Entire Lesson	Instructor confused or hesitant; no inspiration to learners; severe or impatient; voice or manner disconcerting; lesson lacking in uniformity.	Instructor slightly nervous and confused; lacking in conviction; some feeling of hesitance and uncertainty apparent; lesson form and policy changed with some difficulty.	Instructor confident and at ease; natural and pleasing; voice good; professional and business-like attitude; inspiring to learners; uniformity throughout lesson.
	Rate here			
		0 1 2	3 4 5 6 7	8 9 10

Additional comments not covered by rating scale.

Taught by _____ Rated by _____ Date _____

Lesson unit rating sheet adapting the Charles R. Allen Plan — Arranged by A. G. Waidelich, Principal, High School, Torrance, California

Problems and Projects

A BEAM COMPASS

D. E. Kellogg, East High School, Erie, Pennsylvania

(See Supplement No. 263)

The beam compass is one of the items frequently overlooked when the shop teacher is making out his budget, or if it has been listed, it is one of the first to be dropped when the purchasing agent informs him that his budget exceeds his allowance.

The purpose of this design is to produce a serviceable instrument that will meet the requirements of any school shop or drafting department. The cost of materials for this compass is negligible. In fact, all parts except the center point may usually be found in the scrap boxes of the sheet-metal and woodshops. The drawing is shown with a scriber from a combination square, used as a center point, but a carefully sharpened piece of drill rod or even a nail could be used. If the beam compass is to be used for making sheet-metal layouts, scribers may be used at both the center and pencil ends. When it is desirable to draw an inked circle of large radius, a ruling pen may be substituted for the pencil point.

TRIANGULAR END TABLE

Frank L. Wade, Brewster Vocational School, Tampa, Florida

(See Supplement No. 264)

In any article which is to be presented to students, it is necessary to consider first, the distinctiveness of design, and second, its teaching possibilities.

The accompanying design for a triangular end table embodies both of these necessary qualities.

The 12 by 24-in. top may be made of one wide board or of two narrow widths joined together and dressed to ¾ in. in thickness. After marking the shape of the top on this board, it is to be sawed and all three edges dressed smooth. Then measure in 1¼ in. from all three edges on the face side of the board, and setting the cut-off saw to cut ⅛ in. deep, cut a saw kerf along each side. Next, tilt the saw table to an angle of 5 deg. and set the saw to cut 1¼ in. deep, with the gauge ⅜ in. from the saw. Hold the board on edge, and firmly against the gauge and run each edge over the saw in turn. This forms the shaped edge on the top.

The three legs involve the operations of squaring, turning, boring, and mortising. They are exactly alike in all respects except in the mortising. By following the essential dimensions in the design shown in Supplement No. 264, the student may vary the general contour to suit his own ideas.

Each of the three legs is next bored with a 5/8-in. bit to a depth of ¾ in. The boring is to be done from one corner and in the center of the square portion of the leg near the bottom end. It may be necessary to cut a V block to hold the leg while the boring operation takes place.

A mortise is to be cut in two adjoining sides of the front leg and in the side facing front in the two rear legs. These mortised holes are to measure ⅜ by 2½ by ⅞ in. and are to be cut ¼ in. down from the top end and 7/16 in. in from the outer edge of the legs.

The back rail should be fastened in place with glue and 4d finishing nails driven in diagonally. The heads of the nails are to be sunk beneath the surface of the wood with a nail set.

The stretcher, also, may be altered in design as long as its over-all length is maintained.

In making the rails, it will be necessary for the student to follow the dimensions exactly, as any variation will result in the legs being thrown out of plumb. The two front rails are to have rectangular holes cut in them for the drawers.

These drawers, like the top, are triangular in shape. They are to be made according to the general practice of drawer construction.

The rails, legs, and stretchers are next assembled as one unit. They are to be held together with clamps until the glue has had ample time to set.

The drawers are then placed in their respective positions, after which a ¼-in. hole is bored through the top section of the rail, through the drawer front, and into the bottom section of the rail, as shown in the illustration. A 20d spike is then dropped into this hole and sawed off flush with the top edge of the rail. This forms a pivot for the drawer to swing on.

Before assembling the parts, see that each piece is properly sanded.

To assemble the top and the under structure: Place the top upside down on the workbench, and center the under structure on it. Then fasten the two together with small angle irons which are to be fastened to the inside of the rails.

The end table is then ready for the finish, which depends largely upon the kind of wood which has been used.

Probably the best finish for hard wood will be to stain and varnish it. If soft wood has been used, a very pleasing effect may be obtained by using black brushing lacquer for the whole with the edges trimmed in Chinese red.

TYPICAL JOB SHEETS FOR THE METAL SHOP

W. E. Jersey, Whitefish Bay High School, Milwaukee, Wisconsin

Job No. 1 — Corner Brace

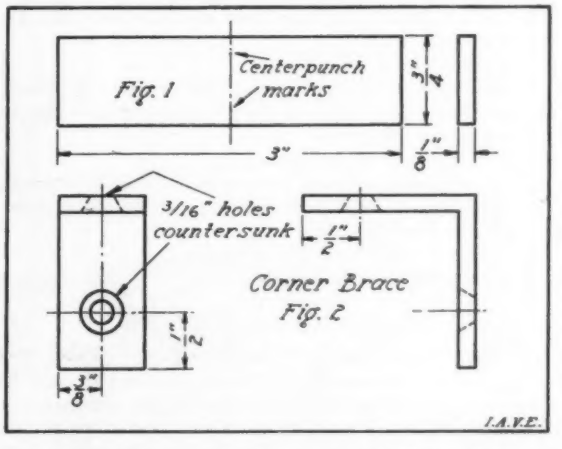
Material: One piece mild steel, ⅛ by ¾ by 3 1/16.

Tools: Hack saw; files; center punch; scratch awl; 3/16-in. drill; countersink; hammer; square; hand drill.

Procedure:

1. Cut stock with hack saw 3 1/16 in. long.

2. Clamp in vise, using smooth jaws and file ends square, making stock 3 in. long when finished. Have work checked.



3. Square lines across center and mark with two light center-punch marks (see Fig. 1).

4. Locate holes at ends of stock and center-punch. Have work checked.

5. Drill 3/16-in. holes at these points.
6. Countersink holes to fit screw heads. Have work checked (see Fig. 2).
7. Place work squarely in vise. Use a mallet to make the 90-deg. bend. Have light line about 1/16 in. above vise jaws to make sides equal after bending.
8. Check with square.
9. Have work checked and graded.

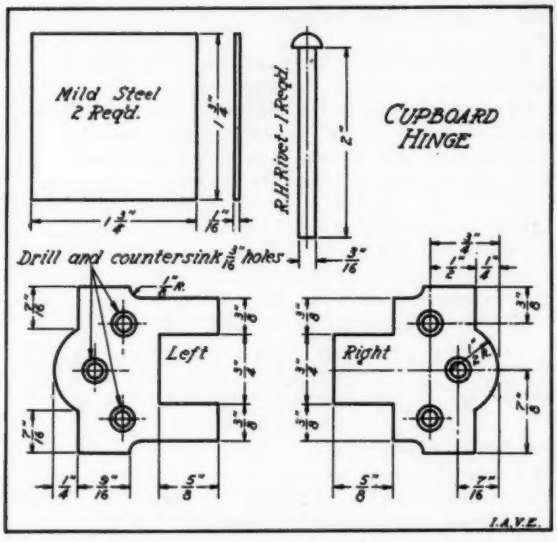
Job No. 2 — Cupboard Door Hinge or "Butterfly Hinge"

Material: Two pieces mild steel, 3/32 by 1¾ by 1¾ in.; one 3/16-in. round-head (r.h.) rivet, 2 in. long.

Tools: Hack saw; files; center punch; scratch awl; 3/16-in. drill; countersink; hammer; square; dividers; hand drills; chisels; tin snips or shears.

Procedure:

1. Each boy makes his own design on cardboard. When approved by the instructor the student uses this as a template to lay out his work on the metal. Figure 2 shows one design.
2. Cut stock 1/16 in. longer than finished length. Use hack saw or chisel.



3. Square ends with file to finished length. Have work checked.
4. Mark out stock using template.
5. Cut out using shears, chisels, and files.
6. Cut two parts being sure they are mates (see Fig. 2), and have work checked.
7. Use rivet for hinge pin.
8. Bend ends on halves to fit hinge pin as shown in demonstration. *Note:* The length of these ends varies according to the thickness of the metal.
9. Join halves to make hinge.
10. Locate centers of holes for screws. Have work checked.
11. Make punch mark with center punch at these points as a guide to start the drill.
12. Drill and countersink 3/16-in. holes.
13. Have work checked and graded.

ARMATURE GROWLER

R. H. Ingersoll, Polytechnic High School, Riverside, California

The growler explained and illustrated herewith will be found very useful for testing old or rewound armatures.

It is made by sawing apart the field frame of an old 12-volt Dodge starter generator. This may be done with a hack saw or on a milling machine.

Remove the pole pieces and the old coils and thoroughly clean the iron. Build a form slightly larger than the neck of the pole pieces and make two coils, each containing 200 turns

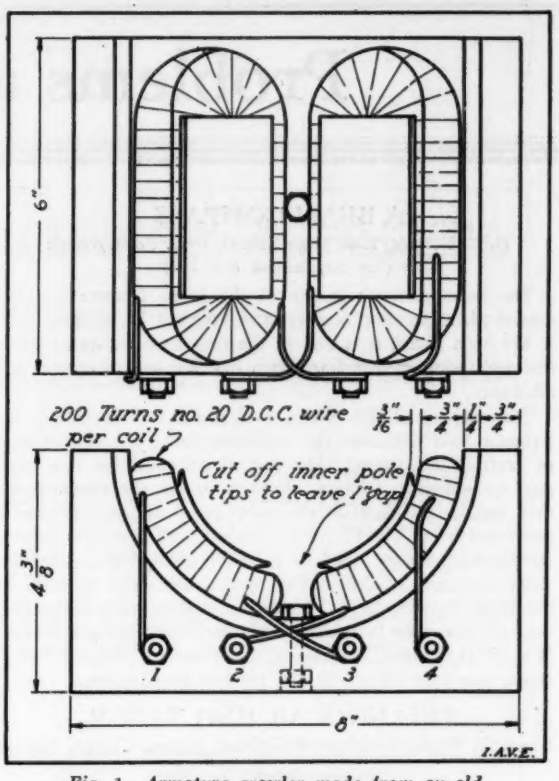


Fig. 1. Armature growler made from an old Dodge generator

of No. 20 d.c.c. wire. After removing the coils from the form they must be taped, varnished, and baked. Before reassembling the coils and fields on the frame, saw off about 3/16 in. from the lower inner edge of each of the pole pieces so as to increase the magnetic gap between them. This causes greater flux to be forced through the armature being tested.

Figure 1 shows the coil connection, and Figure 2 shows how two double-pole, double-throw switches can be used in order to make the growler adaptable for either 110-volt a.c. or 12-volt d.c. current. This arrangement also permits the coils to be used in series or in parallel depending on the available voltage and the winding on the growler.

This growler will heat when alternating current is used.

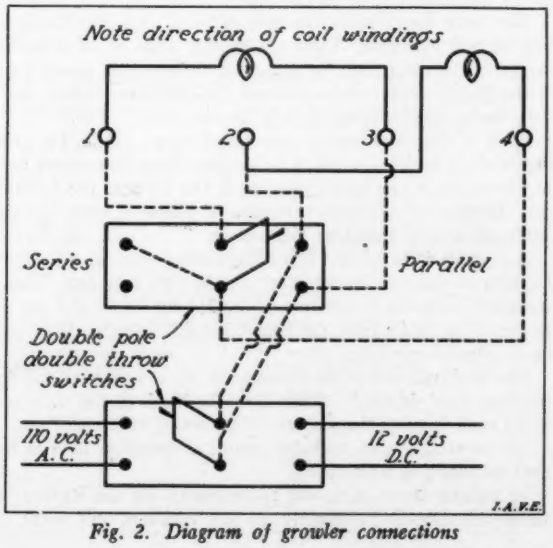


Fig. 2. Diagram of growler connections

PADDLE-WHEEL BOAT

George G. Greene, Lane Technical High School,
Chicago, Illinois

The boat described in this article was designed and made at a summer camp. It fills the want of the average 10-year old boy for a boat which is safe, cheap, and easy to build.

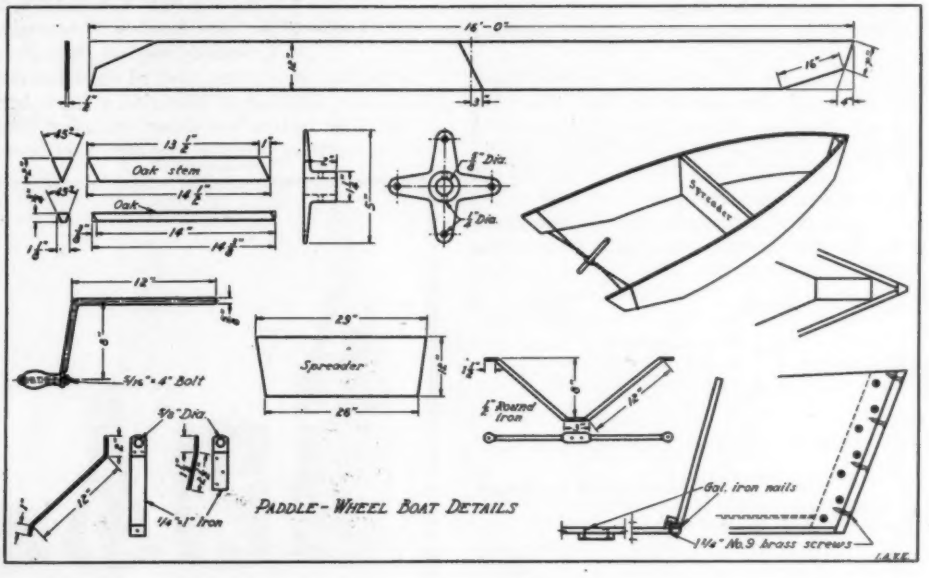
A 200 lb. man in the paddle-wheel boat

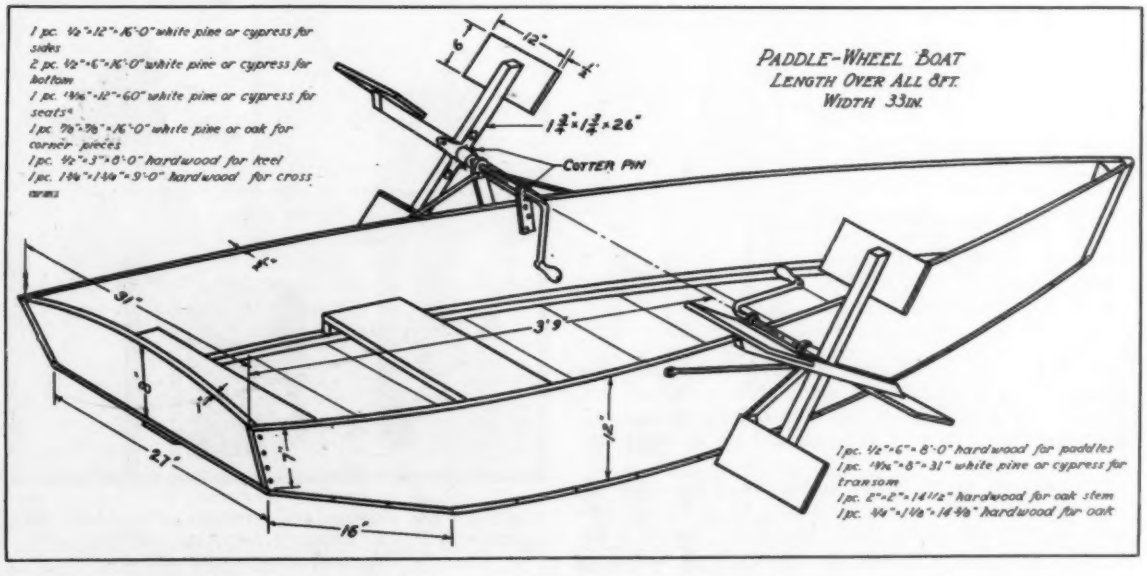
The boat is only 8 ft. long, yet it can safely carry a 200-lb. man. It is easily propelled and steers very well. The cost for wood, paint, screws, and nails is about $3.

The paddle-wheel boat ready to be transported

The cranks, braces, and other metal parts form good projects for the general shop, or for the forge shop.

If desired, a blacksmith will make these parts quite cheaply. The writer of this article would be glad to give further information to anyone who wants to buy the metal parts ready made.




1 pc. ½"×12"×16'-0" white pine or cypress for sides
2 pc. ½"×6"×16'-0" white pine or cypress for bottom
1 pc. 1⅛"×12"×60" white pine or cypress for seats
1 pc. ⅞"×⅞"×16'-0" white pine or oak for corner pieces
1 pc. ½"×3"×8'-0" hardwood for keel
1 pc. 1⅛"×1⅛"×9'-0" hardwood for cross arms
PADDLE-WHEEL BOAT
LENGTH OVER ALL 8FT.
WIDTH 33IN.
1¾"×1¾"×26"
COTTER PIN
3'9"
27"
16"
1 pc. ½"×6"×8'-0" hardwood for paddles
1 pc. 1⅛"×8"×31" white pine or cypress for transom
1 pc. 2"×2"×14½" hardwood for oak stem
1 pc. ¾"×1⅛"×14⅝" hardwood for oak

Safe and reliable

Before fastening the bottom boards in place, they should be painted along the edges and across the ends where they are fastened to the sides. The stem, too, should be well painted before the sides are screwed into place. Do not use steel or iron nails, or screws, as they soon rust out.

The boat should not be placed in the water until it has had at least two coats of good outdoor paint.

INSTRUCTION SHEET FOR THE PATTERNMAKING SHOP

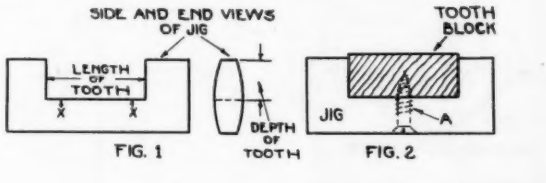
C. W. Illingworth, Racine, Wisconsin

Forming Gear Teeth

There are three methods of making the gear teeth for cast gear wheels:

1. *Band-sawing.* Stock may be added onto the gear wheel, enough to make the outside diameter of the teeth. The teeth are laid out right on the wheel. They may then be band-sawed out, or the teeth may be got out in separate blocks, a template made of the correct shape, and each tooth marked out from the template and sawed to line.

2. *Planing.* Teeth may be fastened in a jig and then planed down to the shape of the tooth.



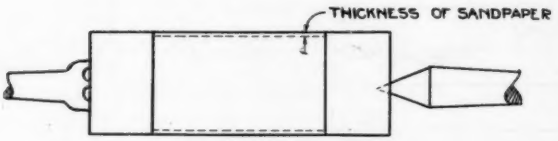


FIG. 3

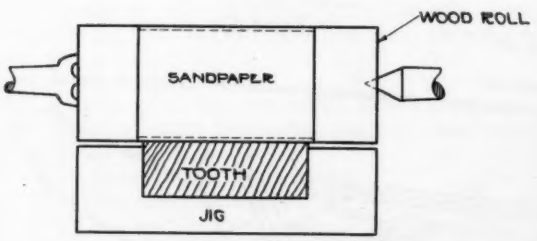


FIG. 4

3. *Sanding.* This is the most popular method and probably the easiest way to get all teeth exactly alike. A jig must first be made having the shape of the tooth laid out on each end. This jig should be about 4 in. longer and 1½ in. wider than the tooth (see Fig. 1).

A recess is cut out of the jig, just the size of the gear tooth. Into this recess are screwed the blocks to be formed into teeth, Figure 2. The blocks should be cut to fit snugly in the recess. A screw is run in from the bottom (as at A, Fig. 2) to hold the block in place. It is a good idea to have two small nails in the bottom of the recess sharpened to fine points (as at X, Fig. 1) which will stick into the block and prevent it from slipping sideways.

When the block is securely fastened in the jig, some of the surplus stock may be cut down to within about 1/16 of an inch with a chisel.

The teeth are then sanded to shape on a round sanding block in the lathe, Figure 3. Care must be taken in making this sanding roll. It should be 3 to 4 in. in diameter and at least as long as the jig, Figure 4. A recess should be cut in the surface into which sandpaper is glued. This recess should be as deep as the thickness of the sandpaper so that when the sandpaper is glued in place it will come flush with the surface of the roll. The width of recess (or of sandpaper) should be about ¼ in. more than the length of the gear tooth, Figure 4.

To sand the teeth to shape, hold the jig with tooth in it up to the revolving sand roll. The tooth block will bear against the sandpaper surface of the roll and the sandpaper will wear the block down until the jig rubs against the wood part of the roll. This will cause the tooth to be sanded the exact shape of the jig.

MAKING LAMP CHIMNEYS

F. E. Tustison, The Stout Institute, Menomonie, Wisconsin

A General-Shop Job Sheet

In the December, 1932, issue of the INDUSTRIAL ARTS AND VOCATIONAL EDUCATION Magazine a porch lantern was described. This lantern was shown without a chimney, but inside chimneys for lamps of this type may be made from or-

Fig. 1. The chimney and remnants after cutting the bottle. — Fig. 2. Chimney for porch lantern. — Fig. 3. The torch lantern with chimney

dinary bottles. It is only necessary to cut the top and bottom from a bottle as shown in Figure 1, and a chimney results. The cutting may be done with a hot wire, the unequal expansion or contraction of the glass serving to break the bottle. This procedure provides additional experiences for pupils in the general shop. The torch lamp shown in Figure 2 makes use of a chimney made of a clear bottle, which was then frosted with carborundum powder. Figure 3 shows a porch lantern with a chimney made of a colored bottle.

Procedure

1. *Select Bottle of Color and Diameter Desired.* Common useful colors are greens and browns. Diameters from 3 to 3½ in. are most desirable. Clear bottles may be used and then frosted with hydrofluoric acid. Frosting can also be done by rubbing the glass with a piece of copper and carborundum powder and water.

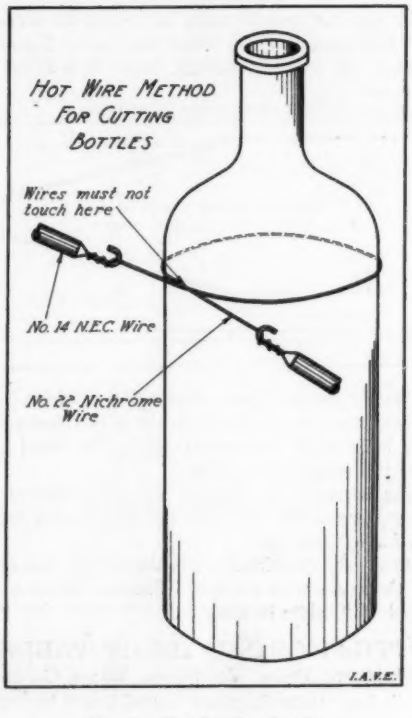


Fig. 4. Cutting the bottle

2. *Mark the Position of the Break.* Use a grease-pencil that will mark glass.

3. *Prepare Cutting Wire and Current Supply.* Use a high-resistance wire about 12 in. long or enough to encircle the bottle, as shown in Figure 4. No 22 nichrome wire is very satisfactory. Connect to one or two storage batteries, preferably through a switch. Use No. 14 rubber-covered copper wire for leads to the nichrome wire. Turn on the current to see if the wire gets red-hot. Only a red-hot wire will cut the bottle successfully. If 110-volt current is available, connect through a rheostat and test as above to get a red-hot wire.

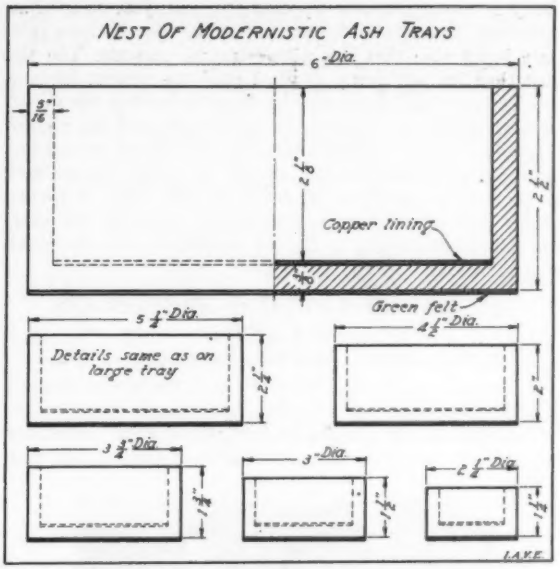
4. *Prepare a Water Bath.* Fill a pail or can with cold water so that the bottle may be immersed at least up to the line of breakage.

5. *Cut the Bottle.* Hold the wire tightly on the mark. (*Caution:* Be sure the wire does not touch at the crossing point.) Turn on the current for about 10 to 15 seconds. Turn off current and quickly immerse the bottle. It should break at the mark. If it fails, allow bottle to cool and try again, either increasing or decreasing the time of heating. If the bottle is cold at the start it will sometimes break before it is immersed in the water. The sharp edges left on the chimney may be removed with a carborundum stone.

NEST OF MODERNISTIC ASH TRAYS

George F. Billey, Detroit, Michigan

The nest of ash trays shown herewith form a good project for a junior-high-school student in a wood-turning class. The project is simple, yet interesting.



The trays are made to fit into each other when not in use. They may be made of walnut, mahogany, or similar wood and finished to match the home furniture, or they may be made of cheaper wood and enameled in various colors, to give a modernistic effect.

The smaller trays are made exactly like the largest one, except that height and diameters differ. The copper is fastened to the bottom of each tray with a small roundheaded screw placed at the center, and the felt is glued to the bottom with furniture glue.

FASTENING HORN TIPS TO A BOW

C. W. Frost, Arcata, California

Clean the pointed ends of the bow and the inside of the horn tips with alcohol to insure the removal of all oil or grease. Slip one of the horns over the end of the bow and mark the location of the bottom edge by drawing a line with a sharp, hard pencil around the wood at that point as shown in Figure 1. Sight down the top of the bow toward the horn to see that it is lined properly, remembering that the top end of the horn should coincide with a line drawn along the back from tip to tip. When the tip is properly aligned, make a witness mark as shown in Figure 2 so that the horn tip may be returned to the same position after the cement is put on. Heat the horn tip and the end of the bow to which is is to be glued to quite a high temperature. This may be done by hanging the horn tip over an electric plate and holding the bow end over it likewise. In about 15 or 20 minutes the horn tip and the wood will be hot enough. Care must be taken to prevent burning them.

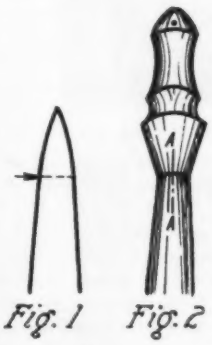


Fig. 1 *Fig. 2*

A double boiler for melting the glue may be made by using two aluminum cups, one small enough to fit within the other. To raise the inner cup above the bottom of the outer, place a few small wrought-iron washers beneath it. Melt some paraffin in the outer cup, place a little De-Khotinsky cement

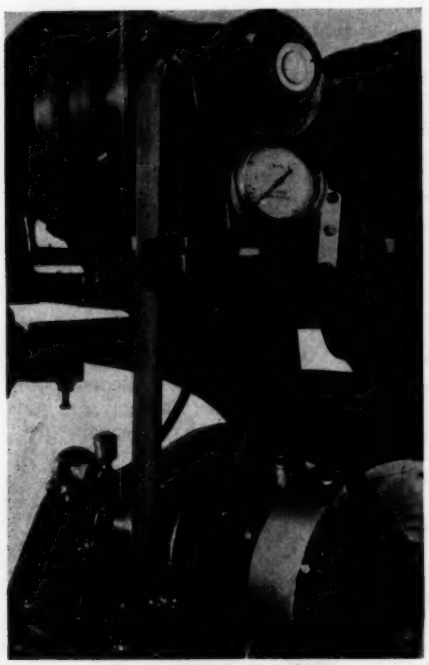
in the inner cup and suspend the latter in the paraffin. Heat the paraffin until the cement melts. About 150 deg. Centigrade is required for this.

As soon as the cement has melted sufficiently, spread a thin layer of the cement over the tip of the bow. The cement will harden on the wood as soon as it touches. Remelt by slowly revolving the bow tip over the heat. Just as soon as the cement melts and commences to run, slip the horn into place being sure that the witness marks coincide. The tip must then be held firmly in place until the cement hardens sufficiently to hold. This may be done by holding the tip of the horn against the edge of the workbench until the cement is hard. If released too soon, the horn will slip off toward the end, leaving an empty space between the wood and the end of the hole in the horn. In about one-half hour or so the cement will be hard enough to permit shooting the bow. Surplus cement should be cleaned off with alcohol and steel wool or fine sandpaper.

CHECKING APPLIED SPEEDS ON THE LATHE

W. L. Nasht, J. S. Morton High School, Cicero, Illinois

In the early stages of apprenticeship in machine-shop practice or toolmaking, even though the common formulas for determining required machining speeds have been thoroughly acquired by the novice, it seems to be a general fact that



Speed indicator on the lathe

arriving at definite speeds on the job is mostly guesswork, and very much in need of a mechanically controlled speed indicator.

The prevailing condition just mentioned simply means that the relation between the results obtained mathematically when applied practically are subject to unchecked material differences and may be of misleading nature. The performances of the apprentice under such conditions, therefore, depend largely on directed and repeated instructions and on his own judgment.

Instantaneous and accurate readings of speeds on a lathe can easily be obtained by mounting a tachometer or an ordinary speedometer as shown in the illustration. The speed indicator should be fastened where it can be conveniently read. It must be connected to the automatic feed driving gear of the lathe with a noiseless fiber gear of a definite pitch and ratio. In this way an accurate rotating motion is transmitted to the speedometer head.

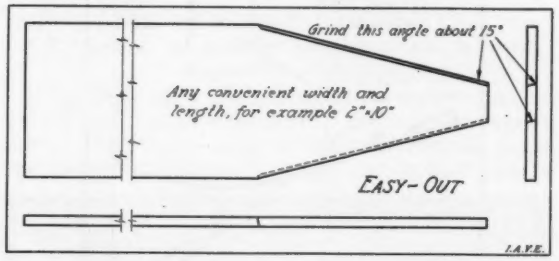
A paper disk, properly laid out, showing definite readings of all the speeds obtainable on the lathe, should be pasted over the old dial. All the lathe speeds will then be registered on the speedometer in terms of r.p.m.

Aside from reducing breakage and burning of tools, drills, etc., very noticeably, this simple but dependable device has outstanding educational value. It specifically insures the bridging over of the theoretical and practical phases of conventionally applied speeds, discards hesitancy, and develops a marked degree of confidence in the recognition of proper cutting speeds.

A HANDY EASY-OUT

C. L. Trowbridge, Turlock Union High School, Turlock, California

A handy easy-out may be made out of an old auto spring. This little implement will be found very useful for removing pipes broken off in their fittings, bolts broken off in the cylinder heads, etc.



For removing broken pipes or bolts with right-hand threads, the easy-out must be ground as shown in the illustration. For removing bolts with left-hand threads, the bevel must be ground in the opposite direction.

The long bevel on the easy-out may be forged or ground. The finished implement should be provided with a hole at the side and for hanging up.

To use the easy-out, drive it into the broken pipe or broken bolt and then turn with a wrench. Pressure has to be applied on the end of it while turning.

UTILITY ROLL-ABOUT TABLE

P. H. Moore, Union High School, Wasco, California

The roll-about table described herewith will be found very useful by the housewife. The average tea wagon has a fine finish and its use in the kitchen is therefore limited.

The utility roll-about table, however, will be found useful for holding the electric toaster or hot plate at the breakfast table, to carry step-saving loads of hot or cold, full or empty vessels, while the meal is being cooked, or on fruit-canning day, wash day, baking day, or on house-cleaning days.

It makes a very useful portable side table at the sink or the cupboard. The trays on this table may be removed readily when they are washed off.

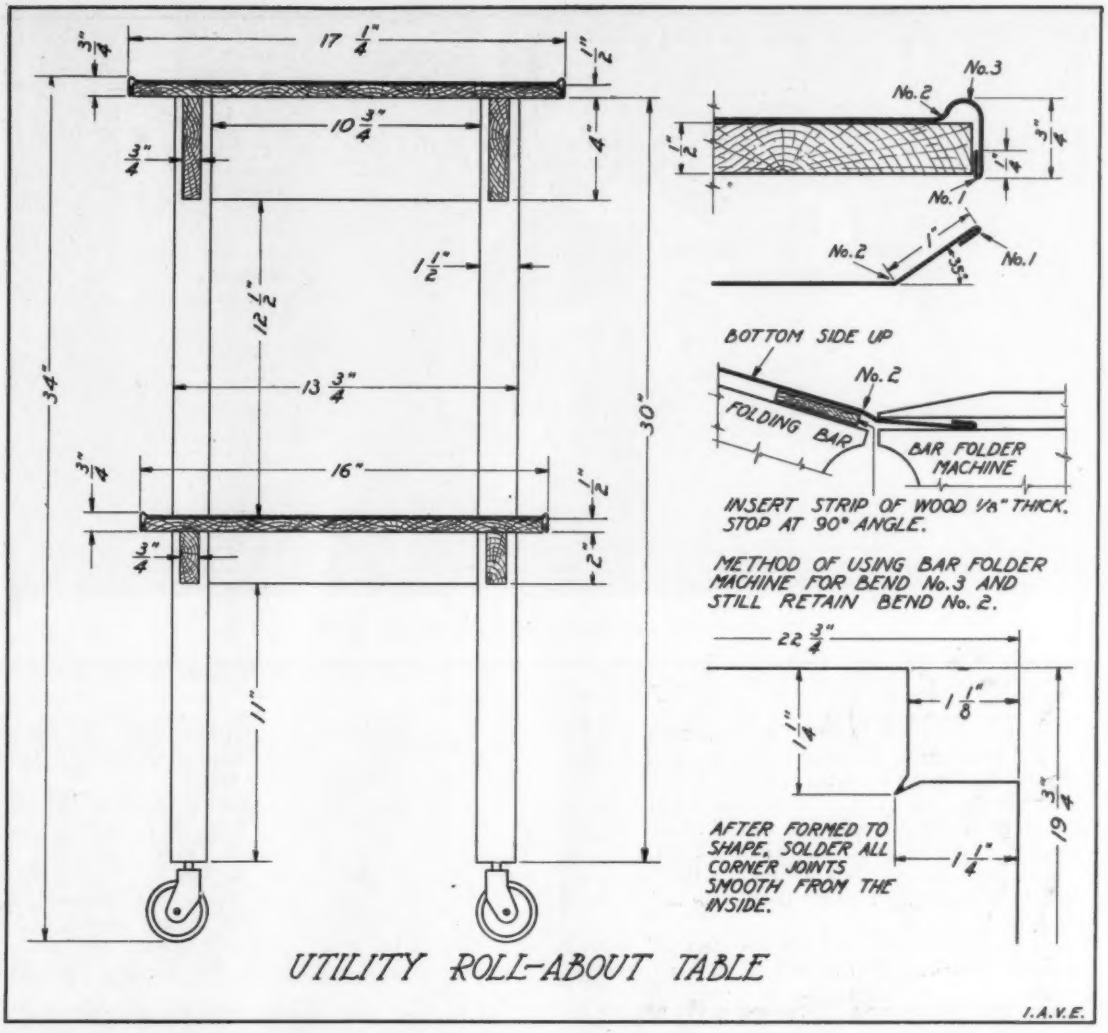
Utility table

Bill of Materials

4 pc.	1½ x	1½ x 30	Leg stock
2 pc.	¾ x	4 x 10¾	Upper rails
2 pc.	¾ x	4 x 13¾	Upper rails
2 pc.	¾ x	2 x 10¾	Lower rails
2 pc.	¾ x	2 x 13¾	Lower rails
1 pc.	½ x	17¼ x 20¼	Top
1 pc.	½ x	13 x 16	Shelf

The table makes a very simple project and tenon joints or dowel joints may be used.

The dairy tin trays also make a very good project for the general shop or the sheet-metal shop.



Pine, bass, or white wood may be used in the construction of the table. It is to be finished with one coat of flat paint and one coat of ivory enamel or lacquer.

A LUMBER RACK FOR SHORT-LENGTH STOCK

C. Anthony Van Kammen, Grand Rapids, Michigan

One of the big problems in any woodworking shop is to keep the lumber rack in a presentable appearance. Short lengths of stock are sure to show up within a week or so after school opens and continue to clutter up the lumber rack, scrap box, or the shop in general if something is not done to overcome the condition.

Fig. 1. Short-length lumber rack

First, it is very good shop practice to have a scrap box in a convenient location. This is to receive only stock not suitable for use in the woodshop, such as cuttings containing knots, end checks, rot, etc. Avoid having any lengths of usable material placed in this receptacle. For all good lumber in lengths from 5 in. to 4 ft., have a special rack close to the regular lumber rack or adjoining the location in which material is cut to rough sizes. Such a rack is shown in Figure 1.

A working drawing of the short-stock rack is shown in Figure 2. Note that a series of graduated shelves is provided so that short stock of similar lengths may be kept together. If desired, thin pieces may be kept on one half of the rack while thick stock is cared for on the other half. Another idea is to keep hard woods on one side and soft woods on the other. The rack should be stained and shellacked or painted to conform with the woodwork in the shop.

Of course, the rack just described will not necessarily end all scrap or short-length lumber troubles. In addition a little system is needed. Organize each class so that one student will be responsible for the care of the scrap box, and another of the short-stock rack, and see that they report the condition of each at the end of every class period. If the teacher is accustomed to appoint a lumber clerk to get out stock, or have someone in charge of the handling of the standard lengths of lumber in the regular rack, the care of the short-lengths rack also may be turned over to him. Note that no lumber is to

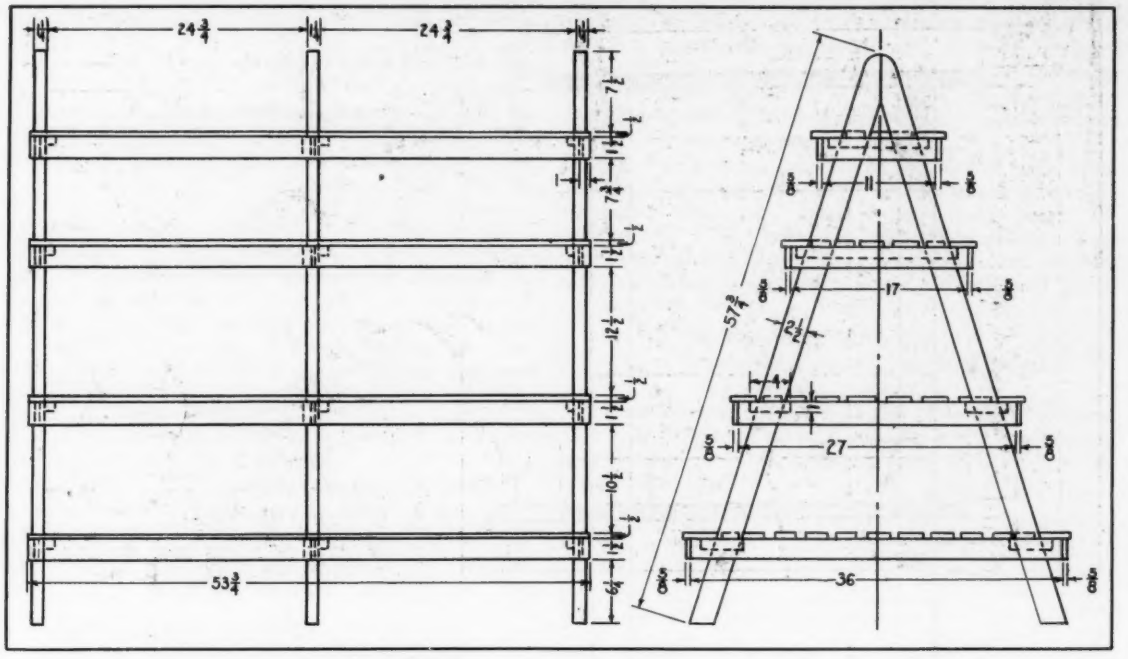


Fig. 2. Short stock rack

be cut from standard lengths until the short-length rack has been visited to determine definitely that no stock of the kind and size suitable for the workman's needs is already cut and waiting in the short-stock rack. It is well also to insist that no stock is to be cut from standard lengths of lumber without the sanction of the instructor who will check the stock bill with the material laid out. This will prevent the "piling up" of short lengths cut from wrong thicknesses and kinds of lumber.

A short-stock lumber rack and a little system will do much to clean up the school shop as well as serve an economic purpose.

KEEP THE SCRAP BOX EMPTY

Harry A. Bailey, John M. Conroy School, Pittsburgh, Pennsylvania

In these days of retrenchment, it is imperative that economy be the watchword in the school shop. The following, therefore, describes a special method devised for securing coöperation in reducing lumber waste.

On a wall-board panel permanently placed on the wall of the shop, is shown the motto "Keep the Scrap Box Empty." Beneath this motto, as shown in Figure 1, are three cards upon which possibilities for the use of "Knotty Pieces," "Narrow Strips," and "Small Pieces" are suggested. Each card lists from 6 to 8 typical uses. Directly beneath each one is a piece of the rough stock, and beneath these again are completed projects which show how the pieces referred to may be used.

The teaching device just described has brought about very satisfactory results, both in the production of useful articles and in the utilization of pieces of material which might otherwise be wasted.

Fig. 1. Suggestions for using up scrap

A USEFUL PROJECT FOR BEGINNING WELDERS

Roy C. Bible, Natrona County High School, Casper, Wyoming

It is very difficult to find a productive job for beginning welders. Practically all welding jobs require that the workman have considerable training, hence the situation so far as the beginner is concerned presents quite a problem.

A production job, however, causes the student to make better progress because he feels right from the start that the thing to strive for is the achievement of sufficient skill to turn out a commercially acceptable job.

In trying to solve this problem, we fortunately selected a job that presents a great many real problems for the beginner and yet produces a marketable product even though the work was done by a beginner.

Casper is the hub of the oil industry in Wyoming, and a large number of oil drums

Discarded oil drums converted into incinerators

are available. Out of these, very handy incinerators for the home may be constructed.

The head of the oil drum is cut out and welded to the steel felloe of an old automobile wheel from which the spokes have been removed. A handle of a 5/16-in. rod and a 6-in. smokestack made of metal about the same weight of the drum, are both welded onto the lid. A cutting torch is then used to cut the hole for the outlet through the stack and a headlamp shell from an automobile may be used as a cap for the smokestack.

The fire opening in the lower part of the drum is made 6½ by 11½ in. A rectangular frame with 5 by 10 in. inside dimensions is made out of ⅛ by ¼-in. band iron, and welded around the opening. The 6½ by 11½-in. piece that has been cut out of the oil drum serves as a door and is hinged on one side. The hinge may be constructed by taking an old wrist pin and welding it to the drum at the side of the door opening. A rod about 6 in. longer than the wrist pin and of a diameter which loosely fits the hole through the wrist pin, is placed in position with both ends projecting about the same amount. These ends are then turned over at right angles and welded to the door.

The incinerators are then painted and a small brass plate is riveted to the lid bearing the following information:

Built by
Natrona County High School
Auto Mechanics Department
Casper, Wyo.

The incinerators are sold and placed within the city for $2 each. Students selling them get a 25-per-cent commission. Besides being a very successful job for the beginner, these incinerators have materially aided us in defraying expenses of the welding department. The construction of these incinerators requires approximately 18 linear feet of welding.

Associations, Conventions

NEW YORK SCHOOL CRAFTS CLUB MEETS

The regular meeting of the New York School Crafts Club was held on Saturday evening, February 18.

Mr. John J. Hatch, of the State Normal School, Newark, N. J., gave a talk on "The Present Status and Trend in Industrial Arts." He stressed the need of picking out the progressive in education and of maintaining good schools, so that it will be possible to come out of the depression with the youth of the country fully prepared to meet a changing world. Mr. Hatch commented on the work of Supt. W. A. Wirt, of Gary, Ind., and told how Dr. Rugg advanced the idea of the child-centered school. Further study of the meaning of individual differences in children must lead to a more determined attack on the problem of the school in taking care of the lower 50 per cent of the boys who do not have the ability to do the work of the high schools as at present organized. It is the duty of the industrial-arts department to share the leadership that is to point the way to necessary modifications in the school program.

Following the talk, Mr. Fred M. Richmond and Mr. Earl L. Page, of the Normal School, led a round-table discussion on "Activities of the General Shop in Schools."

There was an extensive exhibit of projects and jobs carried out in both wood and metal. — *David Petrie.*

OKLAHOMA CITY INDUSTRIAL-ARTS CLUB MEETING

Dean Phillip Donnell, of the School of Engineering, Oklahoma A. & M. College, Stillwater, spoke on shop training at a meeting of the Oklahoma City Industrial-Arts Club, on February 15, at the Hillcrest Club.

Dean Donnell discussed the requirements for entrance to college and stressed the opinion that industrial and technical colleges should require a minimum of training in high-school shops. This is especially desirable, according to Dean Donnell, because it gives students of industrial classes a better background upon which to build their advanced training and education.

Dewitt Hunt, professor of industrial engineering, and Professor Charles Briles, of the State Vocational Education Department, were guests at the meeting.

The program was prepared by Mr. Harry W. McKimmey, president of the Oklahoma City Industrial-Arts Club. — *B. H. Thomas.*

PEORIA INDUSTRIAL EDUCATION CLUB HOLDS MEETING

The monthly dinner meeting of the Peoria Industrial Education Club was held on January 9, at the Enders Hotel, Peoria, Ill.

The first speaker was Mr. Ben Moffatt, head of the Catapillar Training School, who talked on "Impressions of the American Vocational Association at Kansas City." He pointed out that, while the one-thousand mark in attendance was reached, most of those present were state supervisors and the balance were vocational people from Missouri, Kansas, and states near by.

Technocracy was the main topic of discussion, hobby training was urged for leisure, and versatility in vocational training was suggested as a means of making graduates more adaptable. A round-table discussion, led by Dean Siepert and Dr. Grosline, of Bradley Institute, was conducted on the subject, "The End of an Epoch," based on an editorial in the *Journal of Education*. Following the discussion, Dr. Bawden explained certain parts of the editorial and gave facts to back up his statements. — *Floyd F. Barloga.*

PENNSYLVANIA JUNIOR MECHANICS HOLD MEETING

A group of 45 junior-mechanics leaders, representing vocational departments in the public schools of Pennsylvania, held a meeting during the week of December 27, in connection with the convention of the Pennsylvania State Education Association.

At the meeting the association adopted the first state constitution for their organization.

The following officers were elected: President, Mr. W. A. Swartz, Aliquippa; vice-president, Mr. Wayne E. Steiner, Sunbury; secretary, Mr. Earl Farley, Rochester; treasurer, Mr. Lester Fahr, Beaver Falls. The board of directors includes S. L. Coover, California; E. E. Howard, Millersville; Frank Supplee, Treverton; Carl S. Bauer, Williamsport; and Frank D. Rohmer, Midland. — *Wendell A. Swartz.*

AMERICAN HOME ECONOMICS ASSOCIATION

The twenty-sixth annual meeting of the American Home Economics Association will be held June 26 to 30, at Milwaukee, Wis. The central theme of the meeting will be "Home Economics in a Modern World," and the program will include two evening sessions, in addition to the regular day sessions, and the business meeting. Miss Ella Babcock, 111 North Tenth St., Milwaukee, is the local chairman in charge of the convention arrangements.

INDUSTRIAL-ARTS TEACHERS' CONFERENCES

The Department of Public Instruction, Madison, Wis., has announced a series of conferences for industrial-arts teachers, to be held during the months of January, February, and March in fifteen cities of the state. The conferences are being conducted under the direction of the state education department and are promoted by the Wisconsin Industrial-Arts Association. Each conference will be in charge of a supervisor from the state education department.

Personal News

SAMUEL MILO HADDEN DIES

Samuel Milo Hadden, member of the faculty of the State Teachers College, Greeley, Colo., since 1900, succumbed to an attack of heart disease on January 28, at the age of 60.

Mr. Hadden was a native of Iowa, but had lived in Colorado since 1896. Following his graduation from Cooper Memorial College of Sterling, Kans., he was graduated from State Teachers College, Greeley. He received his A.B. and A.M. degrees from Denver University and also studied at Chicago University and at Teachers College, Columbia University.

He spent one year as graduate student at the University of California at Berkeley, and acted as special lecturer at State Teachers College, San Jose, Calif. He served as a member of

SAMUEL MILO HADDEN

various national and state committees on education, and was well known in educational and civic circles.

Hundreds of students and alumni of State Teachers College will sadly miss their beloved "Dean Hadden."

C. L. WETZEL ASSUMES NEW DUTIES

Mr. C. L. Wetzel, former state supervisor of industrial education for Missouri, has accepted the position of associate professor of industrial education in the State Agricultural College, Fort Collins, Colo. In his new position, Mr. Wetzel is in charge of teacher training in vocational education, industrial education, and industrial-arts instruction.

MR. C. L. WETZEL
Associate Professor of Industrial Education,
State Agricultural College, Fort Collins, Colorado

Mr. Wetzel also is conducting extension classes in Denver for vocational teachers. During the summer session, he will be in charge of the industrial-education division at the State Agricultural College, Fort Collins.

—◎—

¶ Mr. W. R. Coles, of Mason, Tenn., has been elected principal of the Gaudet Normal and Industrial School at New Orleans, La. Mr. Coles is a graduate of Smith College, Charlotte, N. C., and was formerly at the Hoffman-St. Mary School at Mason.

¶ Mr. E. W. McMonagle has been elected president of the Vocational Teachers' Association of Green Bay, Wis., succeeding Lamont Ewalt.

¶ Mr. David D. Tate, 67, teacher of industrial arts at Dayton, Ohio, died at his home after a brief illness. Mr. Tate had been a teacher of industrial arts in the local schools for eight years.

ADVERTISING PAGES REMOVED

KANSAS STATE TEACHERS COLLEGE

June 5 to August 4

Department of Industrial Education

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Laboratory courses in Design; Architectural, Freehand, Machine and Mechanical Drawing; Ornamental Iron Work; Sheet Metal and Machine Shop Practice; Pattern Making and Foundry Practice; Hand and Spray Wood and Metal Finishing; Elementary and Advanced Woodworking; Maintenance of Shop Equipment; Elementary and Advanced Furniture Upholstery; Elementary and Advanced Printing and Linotype Operating; Electrical Bench-Work, Electrical Machinery; Wireless Telephony and Electric Wiring and Installation.

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For summer session announcements address:

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For special bulletin of the summer session, address
Director of Summer Session

THE STOUT INSTITUTE
Menomonie, Wisconsin

SchoolShopEquipmentNews

NEW OSCILLATING SPINDLE SANDER

The Yates-American Machine Company, Beloit, Wis., has just placed on the market a new direct motor-driven oscillating spindle sander, known as Type J-45. This sander is especially adapted for sanding internal and external circular and irregular work. The table on this machine is vertically adjustable so that the entire abrasive roll may be used. It may also be tilted for sanding bevel work.

The oscillating mechanism is totally inclosed within the base, and runs in an oil bath. It is easily disconnected so that the spindle may be run without oscillating if that is desirable. This permits the machine to be used as a shaper, and a special shaping spindle is obtainable.

The sander also may be used with special abrasive for metal grinding.

A NEW WAY FOR MARKING TOOLS

The Type Etching Co., 209 Pine St., N.E., Atlanta, Ga., has perfected a new, simple, inexpensive way of etching which can be readily used on all shop tools. The fussiness of applying a wax or asphaltum resist into which the inscription has to be lettered by hand is done away with. Instead a piece of mimeograph stencil cut in the typewriter forms the resist, and the etching fluid is nonacid and harmless when it comes in contact with the hands. This method can be applied to plane or curved surfaces equally well.

Further information may be obtained by writing the Type Etching Company.

NEW SOUTH BEND LATHE AND TOOL CATALOG

The South Bend Lathe Works, South Bend, Ind., has just issued its new Catalog No. 93, containing 72 pages describing and illustrating the entire line of lathes, grinders, tools, and various special attachments. The catalog lists 96 sizes and types of lathes, including bench types with 8-in., 9-in., and 11-in. swing, and floor-leg types from 8-in. to 24-in. swing. In addition, there are descriptions of such attachments as milling and keyway cutters, chucks, undercutters, driving dogs, reamers, arbors, mandrels, and various other tools and accessories.

A copy of Catalog No. 93 may be obtained upon request.

NEW WORKACE POWER MACHINES

The J. D. Wallace & Co., 134 S. California Ave., Chicago, Ill., has recently added three new machines to its list.

The first one, the Workace Scroll Saw, is constructed with a heavy steel table mounted on a cradle so that it can be tilted to 40 deg. It is made in two models, the No. 34 which permits a maximum width of cut of 12 in., and Model 35 which accommodates a width of 24 in. The frame consists of a single heavy-ribbed iron casting which is so built that all moving parts are inclosed. This saw is driven by a patented floating-motor drive which insures correct belt tension at all times.

The second is the Workace Radial Drill which can be obtained either in a bench, floor, or wall model. Its radial feature gives this machine great capacity. A mortising attachment and other accessories may be obtained for this machine.

The third is the Workace Spray Unit which also may be obtained in two sizes. Both of them are compact. They are mounted on steel bases and can be used wherever an electric-light socket is available.

INFORMATION ON ORNAMENTAL IRONWORK

J. G. Braun Company, Inc., of 597 West 35th St., New York City, has issued a series of illustrated booklets on ornamental ironwork, showing the design, construction, and use of ornamental iron for a variety of useful purposes.

The School Shop Shopping Guide

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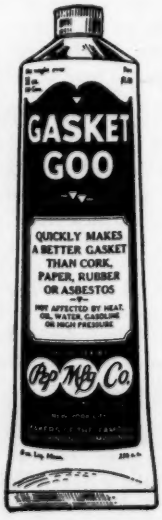

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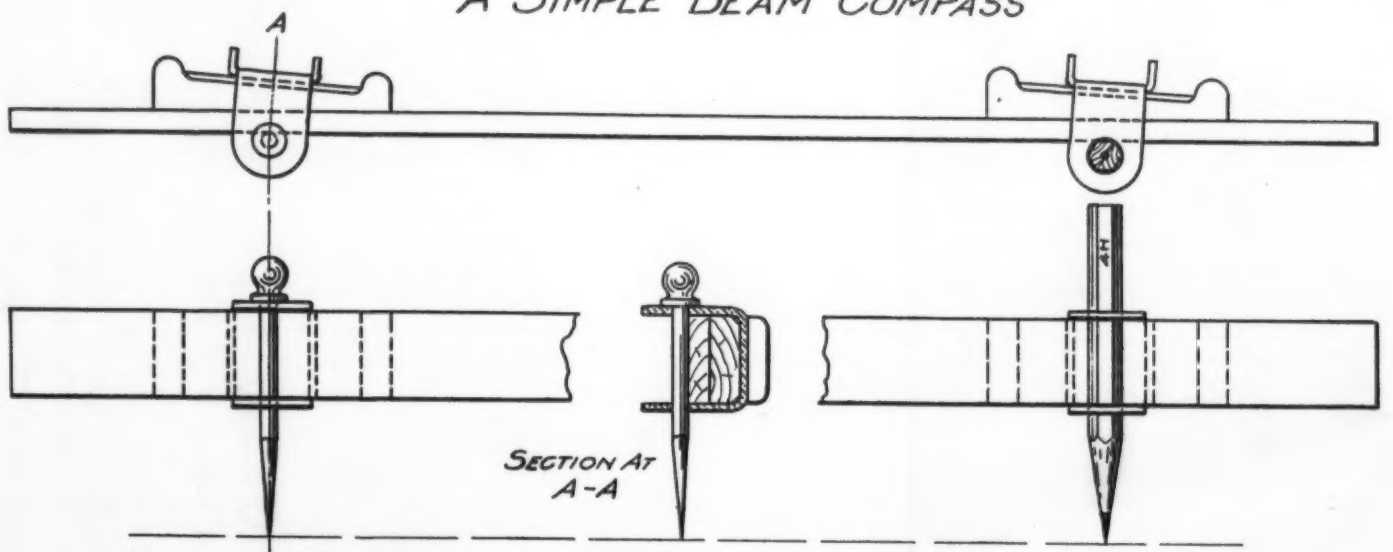
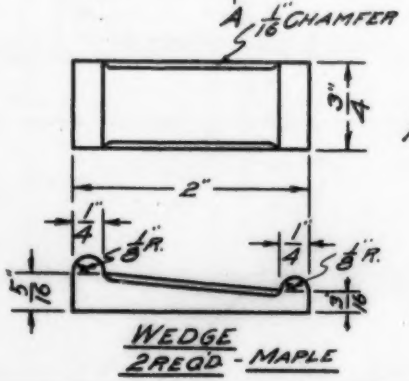
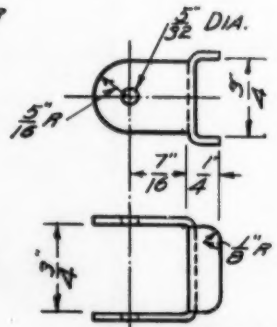
A SIMPLE BEAM COMPASS





WEDGE
2 REQ'D. - MAPLE



YOKE - CENTER
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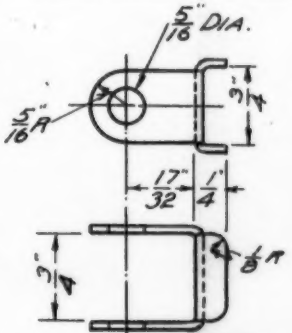
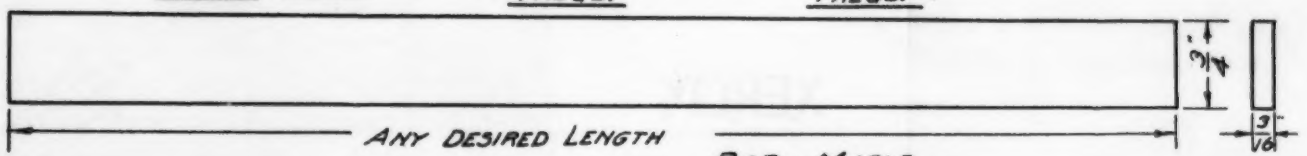


YOKE - PENCIL
1 REQ'D.

CENTER POINT -
USE A SCRIBER
OR ANY KEENLY
SHARPENED STEEL
ROD.



BAR - MAPLE

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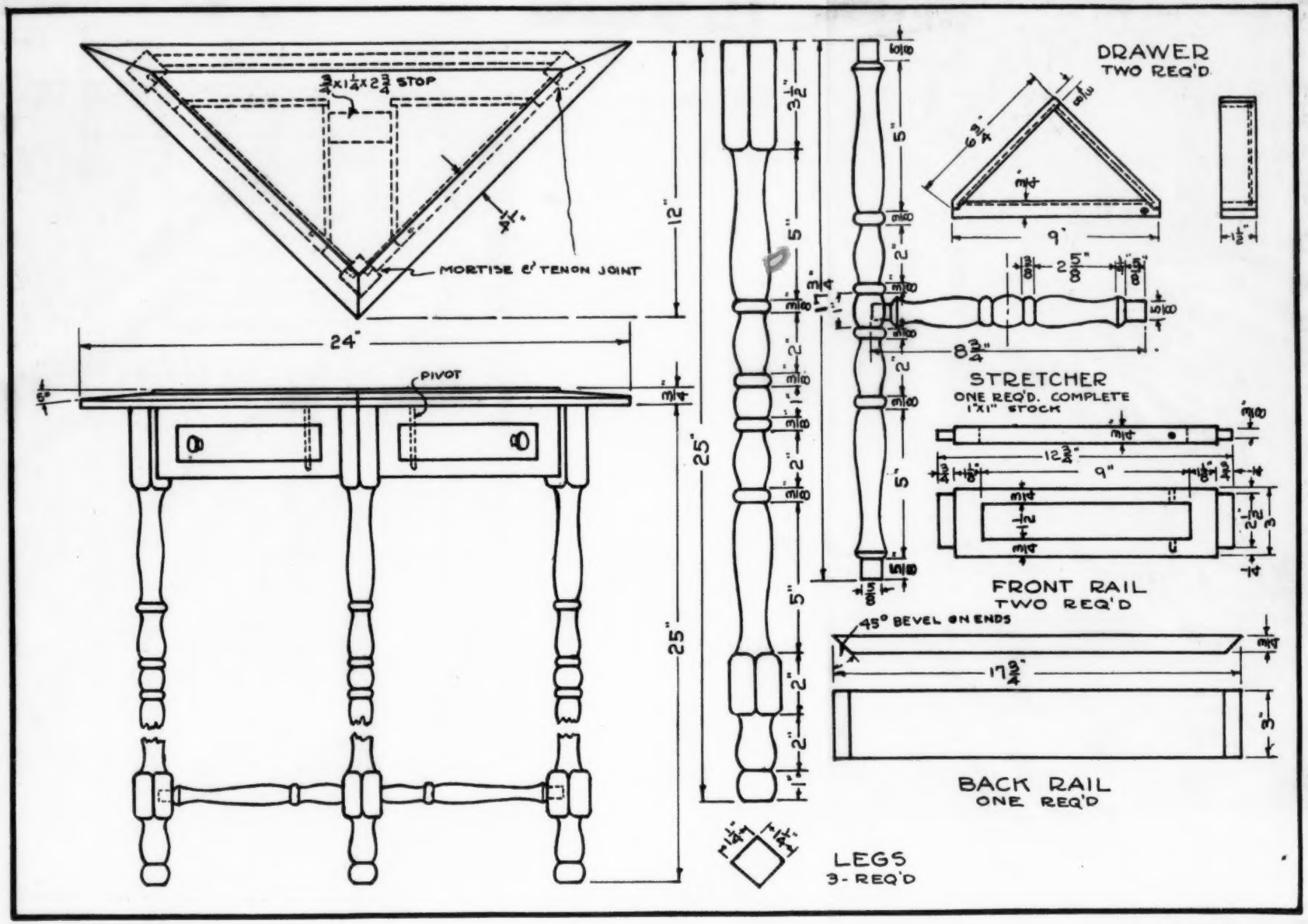
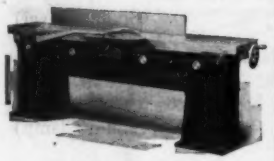


Triangular End Table, Designed by Frank L. Wade, Tampa, Florida

Described Elsewhere in This Issue

"OLIVER" WOODWORKING MACHINERY

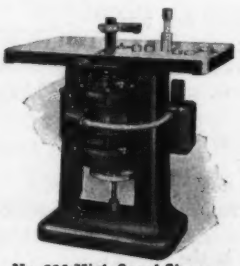
The acceptance of the "Oliver" line by schoolmen is based upon satisfactory results from "Oliver" equipment in use in school shops thruout the country



No. 166 Hand Planer and Jointer

No. 191 Tilting Arbor, Motor-Driven Saw Bench

No. 384 Oilstone Tool Grinder



No. 285 High Speed Shaper

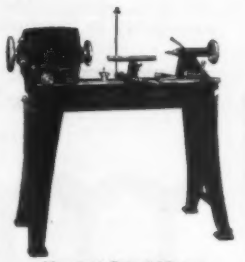
The illustrations herewith present only a few of the many "Oliver" Machines that have a school shop application. Descriptive circulars of any or each machine are available upon request.

All "Oliver" Machines are built to meet the exacting requirements of industry and the school shop. Irrespective of size or price all "Oliver" Machines are built to the same high standard of quality. There are no differences in workmanship or material.

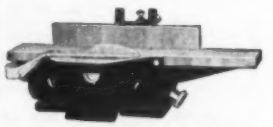
An Invitation to School Shop Executives and Architects

The Oliver Machinery Company in its many years of service to the school shop has had considerable experience in the planning and layout of the school wood shop. We have aided in the completion of hundreds of plans and accordingly invite school shop executives and architects to call upon us for service and advice in making plans, writing specifications, and in suggesting "layouts" for schools.

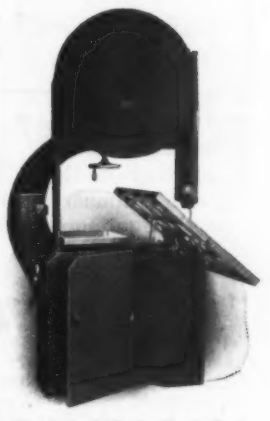
Complete information on any or all machines gladly sent on request. No obligations.



No. 51 4-Speed Motor Head Lathe



No. 133—6-Inch Hand Planer and Jointer



No. 116—36-Inch Band Saw

No. 189 Hand Planer and Jointer

Oliver Machinery Company

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HIGH GRADE MACHINERY

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A POPULAR PROJECT is the Hanging Bookshelf

Tracing Supplement No. 262, March, 1933, Industrial Arts and Vocational Education

This bookshelf uses Klise gallery and fret moulding for embellishment. A revival of early American and Chippendale of particular interest and popularity in the furniture industry.

Fret PF 4059—½" wide

Gallery CG 4707—1⅜" wide

PROJECT REQUIRES:

1' 6"	*CG 4707*	*1⅜"x⅛"*	*5-ply gum*
7' 9¼"	*PF 4059*	*½"x⅛"*	*3-ply birch*
	2 pieces	*T30 knobs*	*Gum*

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A TRADE-TERM TEST

George Roberts, Supervisor of Manual Arts,
Hillside, New Jersey

I'm a tool often used when foundations are made,
I should like you my name to spell;
If you can remember what water will find,
I am sure my name you can tell. (Level)

I'm a tool, very useful, but not often used,
Not round or straight, as you may see;
But degrees and angles, I am sure I can find,
Quickly tell what my name may be. (Sliding Bevel)

I'm a tool sometimes used, made of iron and wood,
My aim is to do my work well;
I hold fast the project, while the boy scrapes the wood,
If my jaws are kept parallel. (Hand Clamp)

I'm a tool that is needed when assembling work,
Not always of just the same length;
My work is to be squeeze tight, any joint that needs glue,
You know I have wonderful strength. (Iron Clamp)

I'm a tool which is used to grip other tools,
The boys love to swing me around;
I believe there's no tool more useful than I,
Pray tell if my name you have found. (Brace)

I'm a tool which belongs to a family of six,
All are willing to do their share;
Each one has an iron, that is beveled to cut,
When the boys adjust it with care.
I'm wondering, when boys use me day after day,
If they ever think of my name;
We all are agreed, to shave and make the wood smooth,
But please do not call each the same.
(Block, Smoothing, Jack, Fore, Jointer and Rabbet Plane)

I'm a tool somewhat long, sometimes kept in a box,
With a lid to keep by face clean;
When you use me, be sure, wet my surface with oil,
Then rub till the blade is made keen. (Oilstone)

I'm a tool long and short, with the point flattened out;
There's a reason for this you may bet;
If the boys hold me upright, and just turn me round,
Why lower and lower I get. (Screw Driver)

I'm a tool, if kept sharp, will do very fine work,
On or in wood is just the same;
I can cut and pare wood, besides cutting square holes,
I think you can now tell my name. (Chisel)

I'm a tool very short, only six inches long,
But for service I can't be beat;
When I'm placed on an edge, and no light shows beneath,
You may know that the job's complete. (Try-Square)

I'm a tool much used by the boys in the school,
Why, I could tell you if I would;
What grows on a rooster's leg, projects through my side,
To mark off the spaces on wood. (Marking Gauge)

I'm a tool often used, made of steel long and thin,
Furnished with a blade and a tongue;
I am covered with marks, and I know my blade's length
Just exceeds by one third, my tongue. (Steel Square)

I'm a tool which when used, continues to travel,
So long as the boys turn me around;
Many times I'm compelled to go where places are dark,
Quite often where iron is found. (Auger Bit, Drill Bit)